

S
333.95
F29cwa
1982
1979-1982



WILDLIFE
WILDLIFE

MONITORING STUDY



FOURTH ANNUAL REPORT

Technical Report
No. 10

MONTANA DEPARTMENT OF NATURAL RESOURCES & CONSERVATION

ENERGY DIVISION

SEPTEMBER 1982

DNRC

MONTANA STATE LIBRARY
S 333.95 E29cwa 1979-1982 c.1
Circle west wildlife monitoring study an



3 0864 00043233 9

CIRCLE WEST WILDLIFE MONITORING STUDY

Fourth Annual Report

For the Period March 1, 1981 - May 31, 1982

Circle West Technical Report No. 10

Prepared by
Larry S. Thompson
Biological Sciences Coordinator
and Pat Nichols
Energy Division
Montana Department of Natural Resources and Conservation
32 South Ewing
Helena, Montana 59620

September 1982

TABLE OF CONTENTS

LIST OF FIGURES.	ii
LIST OF TABLES.	iv
LIST OF APPENDICES.	vi
INTRODUCTION.	1
Study Areas and Objectives.	1
METHODS.	2
General Aerial and Ground Surveys.	2
Waterfowl Survey and Census.	2
Monitoring of Raptor Nests and Grouse Leks.	2
Roadside Wildlife Survey.	2
Small Mammal Trapping.	3
Lagomorph Survey.	3
RESULTS AND DISCUSSION.	4
Wildlife Species Parameters.	4
Tabular Summary.	4
Narrative Accounts for Selected Species.	23
Bird Community Parameters.	33
Waterfowl Communities.	33
Roadside Wildlife Survey.	33
Small Mammal Community Parameters.	44
LITERATURE CITED.	48
ACKNOWLEDGMENTS.	49
APPENDICES.	50

LIST OF FIGURES

- Figure 1. Year-to-year changes in June sample abundance of ring-necked pheasant along five roadside wildlife survey routes, Circle West area.27
- Figure 2. Year-to-year changes in lagomorph density indices, Circle West study area.27
- Figure 3. Year-to-year changes in mule deer production ratios, Circle West study areas (based on September-October ground and aerial survey data).30
- Figure 4. Year-to-year changes in the mule deer winter density index for the Circle West study areas (based on the month of the largest census obtained for the Mine Study Area during the winter season).30
- Figure 5. Year-to-year changes in pronghorn production ratios, Circle West study areas (based on July-October ground and aerial survey data).35
- Figure 6. Year-to-year changes in pronghorn summer and winter density indices for the Circle West study areas (based on the largest aerial censuses obtained for the Mine Study Area during July-October and December-February respectively). . .35
- Figure 7. Percent species composition of all recorded 1981 waterfowl observations, Circle West study area (1977-1981 changes also shown).38
- Figure 8. Year-to-year changes in waterfowl production, Circle West study areas.38
- Figure 9. Year-to-year changes in numbers of species and numbers of registrations of water birds recorded on June runs of five roadside wildlife survey routes, Circle West study area.41
- Figure 10. Year-to-year changes in June breeding bird species richness for five roadside wildlife survey routes, Circle West study area.41

Figure 11. Year-to-year changes in June breeding bird community sigma for five roadside wildlife survey routes, Circle West study area.	..45
Figure 12. Year-to-year changes in June breeding bird species number (exclusive of summer visitors and water birds) for five roadside wildlife survey routes, Circle West study area.	..45
Figure 13. Year-to-year changes in small mammal biomass for six habitats sampled in the Circle West study area (control and experimental data are averaged for combined spring-fall data for each habitat).	..47
Figure 14. Year-to-year changes in spring-fall small mammal biomass change for six habitats sampled in the Circle West study area (control and experimental data are averaged for each habitat).	..47

LIST OF TABLES

Table 1.	Summary of inventory data for bird species observed in the Circle West study area, June 1976 - May 1982.	5
Table 2.	Summary of inventory data for amphibian, reptile, and mammal species observed in the Circle West study area, June 1976 - May 1982.	19
Table 3.	Summary of cumulative numbers of species observed in the Circle West study areas through May 1982.	24
Table 4.	Results of 1981 lagomorph survey, Circle West study area.	28
Table 5.	Classification summary for mule deer observed in the Circle West area, March 1981 - May 1982.	29
Table 6.	Deer and pronghorn aerial census data, Circle West area, March 1981 - January 1982.	31
Table 7.	Classification summary for white-tailed deer observed in the Circle West area, March 1981 - May 1982.	32
Table 8.	Classification summary for pronghorn observed in the Circle West area, March 1981 - May 1982.	34
Table 9.	Summary of July 1981 pronghorn aerial census, Hunting District 650.	36
Table 10.	Species composition of all recorded waterfowl and large water bird observations in the 113-section Mine Study Area during the breeding season, May-July 1980-1982, and during May 1982.	37
Table 11.	Summary of waterfowl breeding season census data for stockponds in the Circle West Mine Study Area, 1981.	39
Table 12.	Summary of 1981 waterfowl production data, Circle West study area.	40
Table 13.	Average sizes of waterfowl broods recorded in the Mine Study Area during 1981.	40

Table 14. Summary of cumulative numbers of species observed during May through July roadside counts, Circle West study area.	.42
Table 15. Summary of 1980-81 changes in May-July sample abundances of selected species sampled by five roadside survey routes, Circle West study area.	.43
Table 16. Summary of small mammal trapping data, Circle West study area, May-October 1981.	.46

LIST OF APPENDICES

Appendix A.	Schedule of March 1981 - May 1982 field work.	50
Appendix B.	Wildlife habitat categories, Circle West Baseline Wildlife Study.	51
Appendix C.	Summary of bird community parameters for five roadside survey routes.	52
Appendix D.	Density indices for mule deer and pronghorn antelope by section.	56

INTRODUCTION

This report describes results of the fourth and final year of the Circle West wildlife monitoring study, coordinated by the Montana Department of Natural Resources and Conservation (DNRC), as described in the Circle West Wildlife Baseline Study Final Report (DNRC 1978) and the first, second, and third wildlife monitoring reports (DNRC 1979, 1980, 1981). The report period extended from March 1, 1981, through May 31, 1982. The monitoring studies were terminated by Meridian Land and Minerals Co. in May 1982.

STUDY AREAS AND OBJECTIVES

Study efforts during this period were primarily limited to the 113-section Mine Study Area, as described in the second monitoring report (DNRC 1980). Within this area, the most intensive study occurred in the 31.5-section Permit Area, defined on January 23, 1980. This Permit Area includes the original 11.5-section Proposed Mining Area, plus additional areas to the northeast and southwest that are being considered for coal strip mining or associated development (see Figure 1 in DNRC 1980). Some work was conducted in the Reconnaissance Study Area (see Map 1 in DNRC 1978), which includes most of McCone County. Results of the concurrent vegetation monitoring study have been presented by Producers (1982).

In order to provide data on big game distribution in the area surrounding the Mine Study Area, the area to be covered by the aerial surveys was expanded in 1982 to include roughly the southern half of McCone County.

METHODS

Field techniques and analytical methods for this fourth year of monitoring followed those described in the wildlife baseline study final report (DNRC 1978). A brief summary of methods employed for individual study segments follows:

GENERAL AERIAL AND GROUND SURVEYS

With the exception of November and December 1981, monthly aerial surveys were made of the Mine Study Area from March 1981 through January 1982. Ground surveys were conducted in all months except November and December 1981 and March 1982. All observations (both ground and aerial) of large mammals, upland game birds, and raptors were recorded on the type of data sheets and maps used during the original baseline study (DNRC 1978). Locations of all recorded observations within the Mine Study Area were plotted on maps at a scale of 1:24,000. All data (including data sheets and field maps) are on file with DNRC.

WATERFOWL SURVEY AND CENSUS

All waterfowl observations were recorded on waterfowl data sheets similar to those used in the baseline study. In addition, censuses were taken of bodies of water in the Mine Study Area three or more times during the study period, using methods described in the first monitoring report (DNRC 1979).

MONITORING OF RAPTOR NESTS AND GROUSE LEKS

Raptor nests located in the Mine Study Area were visited in May, June, and July to determine if eggs or young were present. Also, leks in the Mine Study Area were visited in March and April to determine the number of grouse present.

ROADSIDE WILDLIFE SURVEY

Each of the five roadside wildlife survey routes was run in May and June of 1981, using methods outlined in the baseline study. A new route, the Waller Route (DNRC 1981:56), was established and run in June and July 1981. The Dreyer Ranch route was also run in July 1981. Surveys were run on dates which corresponded closely with the 1977 survey dates. A number of diversity measures and other community parameters were determined for these routes. The average sample abundance of each indicator species, as well as various community parameters, were plotted to graphically portray the nature and magnitude of year-to-year fluctuations.

SMALL MAMMAL TRAPPING

The 12 small mammal traplines sampled in 1979 (numbers 15, 17, 18, 20, 33, 34, 35, 44, and 46-49) were snap-trapped for three consecutive nights in May 1981 and again for three consecutive nights in October 1981. Methods followed those outlined in the baseline study.

LAGOMORPH SURVEY

The two lagomorph survey routes were run consecutively on each of three mornings (November 10-12, 1981) beginning with the mining area route at 0400.

RESULTS AND DISCUSSION

WILDLIFE SPECIES PARAMETERS

Tabular Summary

Two-hundred and eleven species of vertebrates have been observed in the study areas since the studies began in 1976 (5 amphibians, 7 reptiles, 169 birds, and 30 mammals). Data on these vertebrates are summarized in Tables 1 and 2. The types of data included and the abbreviations used in these tables are as follows:

Habitat in Which Observed. Abbreviations correspond to habitat categories defined in Appendix B. The major habitats in which animals were observed during this study are listed in approximate order of decreasing use or indicated preference. Habitats merely crossed by birds in flight or transient mammals are not listed. "Various" indicates use of many different habitats without a clear preference.

Distribution. Numbers correspond to the three study areas described in the text: 1 indicates the Permit Area; 2, the Mine Study Area (excluding the Permit Area); and 3, the Reconnaissance Study Area (excluding the Mine Study Area). A number in this column indicates a sighting in the corresponding study area.

Classification. In its 1973 Red Book, the U.S.D.I. Bureau of Sport Fisheries and Wildlife identified certain species of animals as endangered (E), threatened (T), or status-undetermined (U). Although the classifications reported in the Red Book have been supplanted by the Endangered Species Act of 1973, they still provide a good index of vulnerability to extinction and are listed here. In addition, the Montana Department of Fish and Game (1977), now the Department of Fish, Wildlife and Parks (DFWP), has classified wildlife species as game species (G), nongame species (N), furbearers (F), and migratory game birds (M), and the National Audubon Society has listed in its "Blue List" (Tate 1981) certain species of birds that are experiencing regionwide or continentwide noncyclic population declines (B). Classifications under each system are indicated by the appropriate letter abbreviations.

Evidence. Acceptable evidence for including a species in this table, in order of decreasing reliability, is as follows: S indicates specimen(s) taken (number of specimens, or "P" if partial specimen, is given in parentheses); P, photograph taken; V, visual (sight) record; A, auditory (sound) record; B, reported by biologist(s) other than those directly involved in this study; R, reported by local residents. Only the most reliable evidence is listed in the table.

Table 1. Summary of Inventory Data for Bird species observed in the Circle West Study Area, June 1976 - May 1982.
(see text for explanation of abbreviations)

Species	Preferred Habitat	Distri- bution	Guild	Class- ifi- cation	Status	Evi- dence	Monthly Occurrence											
							Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Common Loon (<u>Gavia immer</u>)	PR	- , 2, -	4680	BN	M	V	-	-	-	T	T	-	-	-	-	-	-	-
Horned Grebe (<u>Podiceps auritus</u>)	PR	1, 2, -	2680	N	M	V	-	-	-	-	T	-	-	-	-	-	-	-
Eared Grebe (<u>Podiceps nigricollis</u>)	SW, PR	1, 2, 3	2682	N	S(NE)	P	-	-	-	T	T	T	T	T	-	-	B	-
Western Grebe (<u>Aechmophorus occidentalis</u>)	SW	, 2, 3	4680	BN	M	V	-	-	-	-	T	T	-	-	-	T	-	-
Pied-billed Grebe (<u>Podilymbus podiceps</u>)	PR	1, 2, 3	2682	N	S(PJ)	V	-	-	-	T	T	T	T	-	T	T	-	-
White Pelican (<u>Pelecanus erythrorhynchos</u>)	SW	- , 2, 3	4680	BN	V	V	-	-	-	B	T	T	B	-	-	-	-	-
Double-crested Cormorant (<u>Phalacrocorax auritus</u>)	SW, PR	1, 2, 3	4687	BN	S(NY)	V	-	-	-	B	B	B	B	T	-	T	-	-
Great Blue Heron (<u>Ardea herodias</u>)	FW, SW, SH, PR, SM	1, 2, 3	4677	BN	S(NY)	V	-	-	-	B	B	B	B	B	B	T	-	-
Black-crowned Night Heron (<u>Nycticorax nycticorax</u>)	PR, SM	- , 2, -	4677	BN	V	V	-	-	-	-	T	T	-	-	-	-	-	-
American Bittern (<u>Botaurus lentiginosus</u>)	SW, PR	1, - , -	2670	BN	M	V	-	-	-	-	T	-	-	-	-	-	-	-
Canada Goose (<u>Branta canadensis</u>)	PR, FW, SW, SH, CU	1, 2, 3	3647	M	S(PJ)	V	-	-	B	B	B	B	B	B	B	B	B	-
Mallard (<u>Anas platyrhynchos</u>)	PR, FW, SG	1, 2, 3	3674	M	S(PJ)	V	-	T	B	B	B	B	B	B	B	B	B	-
Gadwall (<u>Anas strepera</u>)	PR, SG	1, 2, 3	3674	M	S(PJ)	V	-	-	-	B	T	B	B	B	B	B	B	-

Table 1. (continued)
June 1976 - May 1982.

Species	Preferred Habitat	Distri- bution	Guild	Class- ifi- cation	Status	Evi- dence	Monthly Occurrence											
							Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Pintail (<u>Anas acuta</u>)	PR,FW	1,2,3	3674	M	S(PJ)	V	-	-	0	B	B	B	B	T	-	-	-	-
Green-winged Teal (<u>Anas crecca</u>)	PR	1,2,3	3674	M	S(PJ)	V	-	-	0	B	B	B	B	T	0	0	B	-
Blue-winged Teal (<u>Anas discors</u>)	PR,FW,SA	1,2,3	3674	M	S(PJ)	V	-	-	-	B	B	B	0	T	0	B	T	-
Cinnamon Teal (<u>Anas cyanoptera</u>)	PR	1,2,	3674	M	S(RH)	V	-	-	-	-	T	T	-	T	-	-	-	-
American Wigeon (<u>Anas americana</u>)	PR,FW,SH	1,2,3	3674	M	S(PJ)	V	-	-	0	B	B	B	T	T	B	0	B	-
Northern Shoveler (<u>Anas clypeata</u>)	PR,FW,SM, SH	1,2,3	3674	M	S(PJ)	V	-	-	B	B	B	B	B	B	-	-	-	-
Redhead (<u>Aythya americana</u>)	PR	1,2,3	3682	M	S(PJ)	V	-	-	B	B	T	T	T	T	T	B	T	-
Ring-necked Duck (<u>Aythya collaris</u>)	PR	1,2,	3680	M	M	V	-	-	B	T	T	T	-	-	T	B	B	-
Canvasback (<u>Aythya valisineria</u>)	PR	1,2,3	3682	BM	S(PJ)	V	-	-	-	B	T	B	T	-	-	B	B	-
Lesser Scaup (<u>Aythya affinis</u>)	PR,SH	1,2,3	3684	M	S(RH)	V	-	-	0	B	B	T	T	T	-	T	T	-
Common Goldeneye (<u>Bucephala clangula</u>)	PR	-2,3	3680	M	M	V	-	-	B	0	-	T	-	-	-	-	T	-
Bufflehead (<u>Bucephala albeola</u>)	PR,SW	1,2,3	3680	M	M	V	-	-	T	B	T	-	-	-	-	B	B	-
Ruddy Duck (<u>Oxyura jamaicensis</u>)	PR	1,2,3	3682	M	S(CO)	V	-	-	-	-	T	B	B	-	-	T	-	-

Table 1. (continued)
June 1976 - May 1982.

Species	Preferred Habitat	Distri- bution	Guild	Class- ifi- cation	Status	Evi- dence	Monthly Occurrence											
							Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Hooded Merganser (<u>Lophodytes cucullatus</u>)	PR	-2,-	4680	M	M	V	-	-	-	T	T	T	-	-	-	-	T	-
Common Merganser (<u>Mergus merganser</u>)	PR,SW	-2,3	4680	M	M	V	-	-	B	B	-	-	-	-	-	T	-	-
Red-breasted Merganser (<u>Mergus serrator</u>)	PR	-2,-	4680	M	M	V	-	-	-	B	-	-	-	-	-	-	-	-
Turkey Vulture (<u>Cathartes aura</u>)	BA,SC	1,2,3	5233	BN	S(AN)	V	-	-	-	-	T	B	B	B	-	-	-	-
Sharp-shinned Hawk (<u>Accipiter striatus</u>)	CF,CU,TL	-2,3	4267	BN	S(RH)	V	-	-	-	B	-	-	-	-	T	B	-	-
Red-tailed Hawk (<u>Buteo jamaicensis</u>)	Various	1,2,3	4267	N	S(PJ)	P	-	-	-	B	B	B	B	B	B	B	-	-
Swinson's Hawk (<u>Buteo swainsoni</u>)	GR,CU,SC, TL,FR,SG, TC,CG	1,2,3	4267	BN	S(NY)	V	T	-	-	B	B	B	B	B	B	B	-	-
Rough-legged Hawk (<u>Buteo lagopus</u>)	GR,CU,BA TL,SG,LB	1,2,3	4260	N	W	V	B	B	B	T	-	-	-	-	-	B	B	T
Ferruginous Hawk (<u>Buteo regalis</u>)	GR,BA,SC, FR,TL,HJ, TC,BE	1,2,3	4263	BNU	S(PJ)	P	-	-	-	T	T	B	B	B	-	-	B	B
Golden Eagle (<u>Aquila chrysaetos</u>)	Various	1,2,3	4263	N	R(PJ)	P	B	B	B	B	B	B	B	B	B	B	B	B
Bald Eagle (<u>Haliaeetus leucocephalus</u>)	CF,SH,CG	1,2,3	4660	E	W	V	T	B	B	-	-	-	B	-	-	-	B	B
Marsh Hawk (<u>Circus cyaneus</u>)	WM,SR,GR, SS,LC,SG, TC,CU	1,2,3	4264	BN	S(PJ)	V	-	-	B	B	B	B	B	B	B	B	B	-

Table 1. (continued)
June 1976 - May 1982.

Species	Preferred Habitat	Distri- bution	Guild	Classi- fication	Status	Evi- dence	Monthly Occurrence											
							Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Osprey (<u>Pandion haliaetus</u>)	SW,CG	-, -, 3	4687	BNU	S(NY)	V	-	-	-	B	B	B	-	-	-	-	-	-
Prairie Falcon (<u>Falco mexicanus</u>)	GR,BA,SC, CU,CG,SG, PR	1,2,3	4263	BNT	R(PJ)	P	T	B	B	B	B	B	B	B	B	B	-	-
Peregrine Falcon (<u>Falco peregrinus</u>)	CU,SG	1,2,3	4260	NE	M	V	-	B	-	-	B	-	-	-	-	T	-	B
Marlin (<u>Falco columbarius</u>)	CF,CU	-,2,3	4260	BNU	M	V	-	B	-	-	T	-	-	B	-	-	-	-
American Kestrel (<u>Falco sparverius</u>)	GR,CU,SC, BA,CG,TL	1,2,3	2268	BN	S(PJ)	V	-	-	B	B	B	B	B	B	B	T	-	-
Sharp-tailed Grouse (<u>Pedioecetes phasianellus</u>)	See DNRC 1978	1,2,3	3234	BG	R(PJ)	S(P)	B	B	B	B	B	B	B	B	B	B	B	B
Sage Grouse (<u>Centrocercus urophasianus</u>)	SS,SG,BS, BG,SA,GR, RD	1,2,3	1234	BG	R(PJ)	S(P)	T	-	-	B	B	B	B	B	B	T	-	-
Ring-necked Pheasant (<u>Phasianus colchicus</u>)	See DNRC 1978	1,2,3	1234	G	R(PJ)	S(P)	B	B	B	B	B	B	B	B	B	B	B	B
Gray Partridge (<u>Perdix perdix</u>)	CU,GR,LC, SG,SS,BX	1,2,3	1234	G	R(RH)	S(P)	B	B	-	B	B	B	B	B	B	B	B	B
Sandhill Crane (<u>Grus canadensis</u>)	CU,GR,PR	1,2,3	3230	M	M	V	-	-	-	T	-	-	T	-	B	B	T	-
Sora (<u>Porzana carolina</u>)	CM,SM	1,2,3	3672	M	S(TD)	V	-	-	-	-	T	B	-	-	-	-	-	-
American Coot (<u>Fulica americana</u>)	PR,SW,FW	1,2,3	3682	M	S(PJ)	V	-	-	-	B	T	T	T	-	-	T	-	-

Table 1. (continued)
June 1976 - May 1982.

Species	Preferred Habitat	Distri- bution	Guild	Class- ifi- cation	Status	Evi- dence	Monthly Occurrence											
							Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Killdeer (<u>Charadrius vociferus</u>)	SH,GR,SA, CU,SM	1,2,3	2234	M	S(PJ)	V	-	-	B	B	B	T	B	B	T	B	-	-
Black-bellied Plover (<u>Pluvialis squatarola</u>)	GR	1,2,-	2230	M	M	V	-	-	-	-	T	-	-	-	-	-	-	-
Common Snipe (<u>Capella gallinago</u>)	FW,WM,SM	1,2,3	2234	M	S(RH)	B	-	-	-	B	-	T	-	-	T	T	-	-
Long-billed Curlew (<u>Numenius americanus</u>)	GR	1,2,3	2234	MU	S(RH)	V	-	-	-	-	T	T	B	-	-	-	-	-
Upland Sandpiper (<u>Bartremia longicauda</u>)	GR,SA	1,2,3	2234	BM	S(TO)	V	-	-	-	B	B	B	B	-	-	-	-	-
Spotted Sandpiper (<u>Actitis macularia</u>)	FW,PR,SH	1,2,3	2294	M	S(RH)	V	-	-	-	-	T	T	B	B	-	-	-	-
Solitary Sandpiper (<u>Tringa solitaria</u>)	SH,PR	1,2,-	2290	M	M	V	-	-	-	T	T	T	T	-	-	-	-	-
Willet (<u>Catoptrophorus semipalmatus</u>)	CU,WM	1,2,3	2294	M	S(TO)	V	-	-	-	B	T	T	T	T	-	-	-	-
Greater Yellowlegs (<u>Tringa melanoleuca</u>)	SH,PR	-2,3	2290	M	M	V	-	-	-	-	-	T	T	-	T	-	-	-
Lesser Yellowlegs (<u>Tringa flavipes</u>)	SH,PR	-2,3	2290	M	M	V	-	-	-	B	T	T	T	T	-	-	-	-
Baird's Sandpiper (<u>Calidris bairdii</u>)	FW,SH	1,-,-	2290	M	M	V	-	-	-	-	T	-	-	T	-	-	-	-
Least Sandpiper (<u>Calidris minutilla</u>)	FW,SH	1,2,3	2290	M	M	V	-	-	-	-	T	-	T	-	-	-	-	-

Table 1. (continued)
June 1976 - May 1982.

Species	Preferred Habitat	Distri- bution	Guild	Class- ifi- cation	Status	Evi- dence	Monthly Occurrence											
							Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Long-billed Dowitcher (<u>Limnodromus scolopaceus</u>)	FW,SN	1,2,3	2290	M	M	V	-	-	-	-	T	-	T	-	T	-	-	-
Western Sandpiper (<u>Calidris mauri</u>)	FW,SN	1,-,-	2290	M	M	V	-	-	-	-	T	-	-	-	-	-	-	-
Sanderling (<u>Calidris alba</u>)	PR	1,-,-	2290	M	M	V	-	-	-	-	-	-	B	-	-	-	-	-
Marbled Godwit (<u>Limosa fedoa</u>)	PR	-2,-	2290	M	M	V	-	-	-	-	-	-	T	-	-	-	-	-
American Avocet (<u>Recurvirostra americana</u>)	PR,GR	1,2,3	2294	M	S(RH)	V	-	-	-	-	B	T	T	-	-	-	-	-
Wilson's Phalarope (<u>Steganopus tricolor</u>)	FW,PR	1,2,3	2674	N	S(RH)	V	-	-	-	-	B	B	B	-	-	-	-	-
Northern Phalarope (<u>Lobipes lobatus</u>)	FW,PR	1,-,3	2674	N	M	V	-	-	-	-	-	T	-	-	-	-	-	-
California Gull (<u>Larus californicus</u>)	PR,FW,CU, SH	1,2,3	3230	N	V	V	-	-	-	B	-	B	B	B	-	T	-	-
Ring-billed Gull (<u>Larus delawarensis</u>)	PR,CU,GR SH	1,2,3	3230	N	V	V	-	-	-	B	-	B	B	B	-	-	-	-
Common Tern (<u>Sterna hirundo</u>)	PR	1,2,3	2680	BN	V	V	-	-	-	-	T	T	T	-	-	-	-	-
Black Tern (<u>Chlidonias niger</u>)	GR,PR	1,2,3	2682	BN	S(RH)	V	-	-	-	-	T	T	T	-	-	-	-	-
Rock Dove (<u>Columba livia</u>)	CU,GR,OF	-,-,3	1233	N	R(PJ)	V	T	B	B	B	B	B	B	B	B	B	B	T
Mourning Dove (<u>Zenaidura macroura</u>)	TC,CU,GR LC,CG	1,2,3	1236	N	S(PJ)	V	-	-	-	B	B	B	B	B	B	T	-	-

Table 1. (continued)
June 1976 - May 1982.

Species	Preferred Habitat	Distri- bution	Class- ifi- cation	Status	Evi- dence	Monthly Occurrence											
						Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Black-billed Cuckoo (<u>Coccyzus erythrophthalmus</u>)	SF,RS	-, -, 3	N	S(RH)	A	-	-	-	-	-	B	T	-	-	-	-	-
Great Horned Owl (<u>Bubo virginianus</u>)	FG,TC,CG, BA,LC,OF, FR	1,2,3	N	R(PJ)	V	T	B	B	B	B	T	B	B	B	B	T	T
Snowy Owl (<u>Nyctea scandiaca</u>)	CU,GR	-, -, 3	N	W	V	-	B	B	-	-	-	-	-	-	-	-	T
Burrowing Owl (<u>Speotyto cunicularia</u>)	GR,SG	1,2,3	8NU	S(PJ)	S(1)	-	-	-	B	B	B	B	B	B	-	-	-
Long-eared Owl (<u>Asio otus</u>)	CG	-, -, 3	BN	S(RH)	V	-	-	-	-	-	B	-	-	-	-	-	-
Short-eared Owl (<u>Asio flammeus</u>)	WM,SG,GR, CU,SR	1,2,3	BN	R(PJ)	S(1)	B	T	-	B	T	T	B	B	B	T	-	-
Common Nighthawk (<u>Chordeiles minor</u>)	CG,GR,SS, TC	1,2,3	N	S(NE)	V	-	-	-	-	B	B	B	B	B	-	-	-
Belted Kingfisher (<u>Megasceryle alcyon</u>)	SM,FW	-, 2, 3	N	S(RH)	V	-	-	-	-	B	T	-	-	-	-	-	-
Common Flicker (<u>Colaptes auratus</u>)	CF,CG,FG, SG,GR	1,2,3	B	S(RH)	V	-	-	-	B	B	B	B	B	B	T	-	-
Red-headed Woodpecker (<u>Melanerpes erythrocephalus</u>)	CF,CG,GR	1,2,3	BN	S(RH)	V	-	-	-	-	B	B	B	B	B	-	-	-
Hairy Woodpecker (<u>Picoides villosus</u>)	FG	-, 2, 3	BN	R(SS)	V	-	B	-	-	-	T	-	T	-	-	-	-
Downy Woodpecker (<u>Picoides pubescens</u>)	TC	-, 2, -	N	W	V	-	T	-	-	-	-	-	-	-	-	-	-
Eastern Kingbird (<u>Tyrannus tyrannus</u>)	TC,LC,SG, GR,SR	1,2,3	N	S(PJ)	V	-	-	-	-	B	B	B	B	B	-	-	-

Table 1. (continued)
June 1976 - May 1982.

Species	Preferred Habitat	Distri- bution	Guild	Classi- fication	Status	Evi- dence	Monthly Occurrence											
							Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Western Kingbird (<u>Tyrannus verticalis</u>)	TC,CG,FG, LC,GR	1,2,3	2557	N	S(PJ)	V	-	-	-	-	B	B	B	B	-	-	-	-
Say's Phoebe (<u>Sayornis saya</u>)	BA,GR,TC	1,2,3	2553	N	S(NY)	V	-	-	-	B	B	B	B	B	-	-	-	-
Least Flycatcher (<u>Empidonax minimus</u>)	FG,CF,TC	- ,2,3	2556	BN	S(TO)	V	-	-	-	-	B	B	T	-	-	-	-	-
Empidonax Flycatcher (<u>Empidonax</u> spp.)	SG,TC	1,2,-	2550	N	M	V	-	-	-	-	T	-	-	-	-	-	-	-
Western Wood Pewee (<u>Contopus sordidulus</u>)	BX,FG	- ,2,3	2557	N	S(RH)	A	-	-	-	-	T	B	-	-	-	-	-	-
Horned Lark (<u>Eremophila alpestris</u>)	GR,CU,SG	1,2,3	3234	N	R(NY)	S(2)	B	B	B	B	B	B	B	B	B	B	B	B
Tree Swallow (<u>Iridoprocne bicolor</u>)	FW,CF	- ,-,3	2508	N	S(RH)	V	-	-	-	-	-	T	-	-	-	-	-	-
Bank Swallow (<u>Riparia riparia</u>)	GR,SA,SM	1,2,3	2503	N	S(AN)	V	-	-	-	-	T	B	B	B	-	-	-	-
Rough-winged Swallow (<u>Stelgidopteryx ruficollis</u>)	GR,SA,SM	1,2,3	2503	N	S(RH)	V	-	-	-	-	B	B	B	B	-	-	-	-
Barn Swallow (<u>Hirundo rustica</u>)	AF,OF,GR	1,2,3	2503	N	S(NY)	V	-	-	-	-	B	B	B	B	-	-	-	-
Cliff Swallow (<u>Petrochelidon pyrrhonota</u>)	GR,SA,AF	1,2,3	2503	N	S(NY)	V	-	-	-	-	B	B	B	B	-	-	-	-
Black-billed Magpie (<u>Pica pica</u>)	CF,TC,LC, CG,FG,GR	1,2,3	3236	N	R(PJ)	V	B	B	B	B	B	B	B	B	B	B	B	B
Common Crow (<u>Corvus brachyrhynchos</u>)	CF,GR,CU	1,2,3	3237	N	S(RH)	V	-	-	-	B	B	B	B	B	B	T	-	-

Table 1. (continued)
June 1976 - May 1982.

Species	Preferred Habitat	Distri- bution	Guild	Class- ifi- cation	Status	Evi- dence	Monthly Occurrence											
							Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Black-capped Chickadee (<u>Parus atricapillus</u>)	CF,TC,RS, FG	-,-,3	234B	N	R(TO)	V	T	B	B	-	T	T	B	-	B	B	B	B
Red-breasted Nuthatch (<u>Sitta canadensis</u>)	FG	-,-,3	212D	N	M	V	-	-	-	-	-	-	-	-	B	-	-	-
House Wren (<u>Troglodytes aedon</u>)	CF,FG	-,-,3	223B	N	S(TO)	V	-	-	-	-	B	B	B	T	-	-	-	-
Rock Wren (<u>Salpinctes obsoletus</u>)	BA,SC	1,2,3	2233	N	S(TO)	V	-	-	-	B	B	B	B	B	B	-	-	-
Grey Catbird (<u>Dumetella carolinensis</u>)	CF,RS	-,-,3	2336	N	S(RH)	V	-	-	-	-	B	T	B	-	-	-	-	-
Brown Thrasher (<u>Toxostoma rufum</u>)	LC,TC,GR	1,2,3	2335	N	S(PJ)	V	-	-	-	-	B	B	B	B	-	-	-	-
Sage Thrasher (<u>Oreoscoptes montanus</u>)	BS,BA	-,-,3	2335	N	S(TO)	A	-	-	-	-	T	T	B	-	-	-	-	-
American Robin (<u>Turdus migratorius</u>)	FG,LC,GR, TC	1,2,3	3237	N	R(RH)	V	B	-	T	B	B	B	B	B	B	B	U	-
Swainson's Thrush (<u>Catharus ustulatus</u>)	BX	1,2,3	233D	N	M	A	-	-	-	-	B	-	-	-	-	-	-	-
Mountain Bluebird (<u>Sialia currucoides</u>)	GR,BA	1,2,3	233B	N	S(TO)	V	-	-	T	-	T	B	B	B	B	-	-	-
Townsend's Solitaire (<u>Myadestes townsendi</u>)	FG	-,-,3	333D	N	W	A	-	-	-	-	-	-	-	-	-	-	-	B
Golden-crowned Kinglet (<u>Regulus satrapa</u>)	TC	-,-,3	333D	BN	M	V	-	-	-	-	-	-	-	-	-	T	-	-
Water Pipit (<u>Motacilla spinolette</u>)	SH	-,-,3	229D	N	M	V	-	-	-	B	-	-	-	-	-	-	-	-

Table 1. (continued)
June 1976 - May 1982.

Species	Preferred Habitat	Distri- bution	Guild	Classi- fi- cation	Status	Evi- dence	Monthly Occurrence											
							Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Sprague's Pipit (<u>Anthus spreagueii</u>)	SG	1,2,3	2234	N	S(TO)	V	-	-	-	B	B	B	B	B	-	-	-	-
Bohemian Waxwing (<u>Bombycilla garrulus</u>)	CF,RS,CU	-, -,3	1440	N	W	V	B	B	B	-	-	-	-	-	-	-	B	B
Cedar Waxwing (<u>Bombycilla cedrorum</u>)	CF,RS,FG	-, -,3	3447	N	S(RH)	V	-	-	-	-	-	-	T	-	B	-	-	-
Northern Shrike (<u>Lanius excubitor</u>)	TC,GR,SG	1,2,3	4260	N	W	S(1)	B	B	-	-	-	-	-	-	-	B	B	B
Loggerhead Shrike (<u>Lanius ludovicianus</u>)	TC,LC,GR, SG	1,2,3	4226	BN	S(PJ)	S(1)	-	-	-	B	B	B	B	B	-	-	-	-
Starling (<u>Sturnus vulgaris</u>)	OF,AF,FG, CG	1,2,3	3233	N	R(NY)	V	T	-	B	B	B	B	B	B	B	B	B	B
Red-eyed Vireo (<u>Vireo olivaceus</u>)	CF	-, -,3	2447	N	S(RM)	A	-	-	-	-	-	-	T	-	-	-	-	-
Warbling Vireo (<u>Vireo gilvus</u>)	CG,FG,CF	-,2,3	2447	BN	S(TO)	V	-	-	-	-	B	B	B	-	-	-	-	-
Tennessee Warbler (<u>Vermivora peregrina</u>)	BX,FG	-, -,3	2440	N	M	S(1)	-	-	-	-	T	-	-	-	-	-	-	-
Orange-crowned Warbler (<u>Vermivora calata</u>)	BX	-, -,3	2440	N	M	V	-	-	-	B	-	-	-	-	-	-	-	-
Yellow Warbler (<u>Oendroica petechia</u>)	LC,TC,SR, FG,CF,CG	1,2,3	2336	BN	S(TO)	V	-	-	-	-	B	B	B	-	-	-	-	-
Magnolia Warbler (<u>Oendroica magnolia</u>)	FG	-, -,3	2330	N	M	V	-	-	-	-	T	-	-	-	-	-	-	-

Table 1. (continued)
June 1976 - May 1982.

Species	Preferred Habitat	Distri- bution	Guild	Class- ifi- cation	Status	Evi- dence	Monthly Occurrence											
							Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Yellow-rumped Warbler (<u>Dendroica coronata</u>)	TC,LC,SR, SS	1,2,3	3230	N	M	V	-	-	-	B	T	-	-	-	B	T	-	-
Blackpoll Warbler (<u>Dendroica striata</u>)	PW,CG,RC	-2,3	2330	N	M	P	-	-	-	-	T	-	-	-	-	-	-	-
Northern Waterthrush (<u>Seiurus noveboracensis</u>)	PW,CG	-2,-	2230	N	M	V	-	-	-	-	T	-	-	-	-	-	-	-
Common Yellowthroat (<u>Geothlypis trichas</u>)	SR,SS,LC	1,2,3	2334	N	S(AF)	V	-	-	-	-	B	B	B	B	-	-	-	-
Yellow-breasted Chat (<u>Icteria virens</u>)	TC	1,2,3	2336	BN	S(TO)	V	-	-	-	-	T	B	B	B	-	-	-	-
American Redstart (<u>Setophaga ruticilla</u>)	CG,BX	1,2,3	2447	N	S(RH)	V	-	-	-	-	T	-	-	-	-	-	-	-
Wilson's Warbler (<u>Wilsonia pusilla</u>)	RS,TC	-2,3	3230	N	M	V	-	-	-	-	-	-	-	-	-	B	T	-
House Sparrow (<u>Passer domesticus</u>)	OF,AF,FG	1,2,3	3233	N	R(PJ)	V	B	B	B	B	B	B	B	B	B	B	B	B
Bobolink (<u>Oolichonyx oryzivorus</u>)	CU	1,2,3	3234	N	S(AF)	V	-	-	-	-	B	T	T	-	-	-	B	-
Western Meadowlark (<u>Sturnella neglecta</u>)	GR,SS,SG, CU,LC,SR	1,2,3	2234	N	S(NY)	V	-	-	T	B	B	B	B	B	B	B	T	-
Yellow-headed Blackbird (<u>Xanthocephalus xanthocephalus</u>)	SM,GR	1,2,3	2231	N	S(TO)	V	-	-	-	B	B	B	B	B	-	T	-	-
Red-winged Blackbird (<u>Agelaius phoeniceus</u>)	CM,SM,GR	1,2,3	2231	N	R(NY)	V	-	B	T	B	B	B	B	B	B	B	T	-
Orchard Oriole (<u>Icterus spurius</u>)	BX,CF	-2,3	2447	N	S(TO)	V	-	-	-	-	B	T	-	-	-	-	-	-

Table 1. (continued)
June 1976 - May 1982.

Species	Preferred Habitat	Distri- bution	Guild	Class- ifi- cation	Status	Evi- dence	Monthly Occurrence											
							Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Northern Oriole (<u>Icterus galbula</u>)	CF,CG,BX, SS,TC	1,2,3	2447	N	S(TO)	V	-	-	-	-	B	B	B	T	-	-	-	-
Brewer's Blackbird (<u>Euphaga cyanocephalus</u>)	GR,CU,BA, TC	1,2,3	2234	N	S(PJ)	S(1)	-	-	-	B	B	B	B	B	T	B	T	-
Common Grackle (<u>Quiscalus quiscula</u>)	GR,CG	1,2,3	2236	N	S(RH)	V	-	-	-	B	B	B	B	T	-	-	-	-
Brown-headed Cowbird (<u>Molothrus ater</u>)	GR,LC,TC	1,2,3	223-	N	S(NE)	V	-	-	-	-	B	B	B	T	T	-	B	-
Rose-breasted Grosbeak (<u>Pheucticus ludovicianus</u>)	LC,TC	1,-,-	3330	N	M	V	-	-	-	-	-	-	-	-	-	T	-	-
Black-headed Grosbeak (<u>Pheucticus melanocephalus</u>)	TC	-2,-	3330	N	V	V	-	-	-	-	T	-	-	-	-	-	-	-
Lazuli Bunting (<u>Passerina amoena</u>)	RS,CU	-,-,3	3236	N	S(TO)	V	-	-	-	-	B	B	B	-	-	-	-	-
Gray-crowned Rosy Finch (<u>Leucosticte tephrocotis</u>)	LC	1,-,3	1230	N	M	V	T	-	-	-	-	-	B	-	-	-	-	-
Common Redpoll (<u>Acanthis flammea</u>)	CU,GR,TC	1,2,3	1230	N	W	V	B	B	B	-	-	-	-	-	-	B	B	B
American Goldfinch (<u>Spinus tristis</u>)	FG,TC,RS, CG,LC,GR	1,2,3	1236	N	S(RH)	V	-	-	-	-	B	B	B	B	B	-	-	-
Rufous-sided Towhee (<u>Pipilo erythrophthalmus</u>)	TC,LC	1,2,3	3235	N	S(PJ)	V	-	-	-	-	B	B	B	B	B	-	-	-
Lark Bunting (<u>Calamospiza melanocorys</u>)	SS,SG,GR	1,2,3	3234	N	S(PJ)	V	-	-	B	-	B	B	B	B	-	-	B	-
Savannah Sparrow (<u>Passerculus sandwichensis</u>)	GR,SS,WM	1,2,3	3234	N	S(TO)	V	-	-	-	-	B	B	B	-	B	-	-	-

Table 1. (continued)
June 1976 - May 1982.

Species	Preferred Habitat	Distri- bution	Guild	Class- ifi- cation	Status	Evi- dence	Monthly Occurrence											
							Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Grasshopper Sparrow (<u>Ammodramus</u> <u>savannarum</u>)	SG, GR	1, 2, 3	3234	BN	S(TO)	V	-	-	-	-	B	B	B	-	-	-	-	-
Baird's Sparrow (<u>Ammodramus</u> <u>bairdii</u>)	GR, SA	1, 2, 3	3234	N	S(TO)	V	-	-	-	-	T	T	T	-	-	-	-	-
Vesper Sparrow (<u>Poocetes</u> <u>gamineus</u>)	SS, SG, GR, BS, BG	1, 2, 3	3234	BN	S(TO)	S(1)	-	-	-	B	B	B	B	B	B	-	-	-
Lark Sparrow (<u>Chondestes</u> <u>grammacus</u>)	GR, BA, SG	1, 2, 3	3234	N	S(PJ)	V	-	-	-	-	B	B	B	B	T	-	-	-
Dark-eyed Junco (<u>Junco</u> <u>hyemalis</u>)	TC, SG, BA	1, 2, 3	3230	N	M	V	-	-	-	-	-	-	-	-	B	T	-	-
Tree Sparrow (<u>Spizella</u> <u>arborea</u>)	TC, RS, SR, WI	1, 2, 3	1230	N	W	V	T	T	B	T	-	-	-	-	-	B	T	-
Chipping Sparrow (<u>Spizella</u> <u>passerina</u>)	SS, SG, TC, RS	1, 2, 3	3236	N	S(RH)	V	-	-	-	-	B	T	B	B	B	-	T	-
Clay-colored Sparrow (<u>Spizella</u> <u>pallida</u>)	SR, RS	1, 2, 3	3234	N	S(TO)	V	-	-	-	-	B	B	B	B	-	-	-	-
Brewer's Sparrow (<u>Spizella</u> <u>breweri</u>)	SS, SG, BS, BG	1, 2, 3	2235	N	S(NY)	V	-	-	-	B	B	B	B	B	B	-	-	-
Field Sparrow (<u>Spizella</u> <u>pusilla</u>)	GR, SG	1, 2, 3	3234	N	S(TO)	V	-	-	-	-	B	B	B	B	-	-	-	-
Harris' Sparrow (<u>Zonotrichia</u> <u>querula</u>)	FG	-,-, 3	3230	N	M	V	-	-	-	-	T	-	-	-	-	-	-	-
White-crowned Sparrow (<u>Zonotrichia</u> <u>leucophrys</u>)	TC, RS, CF	1,-, 3	1230	N	M	V	-	-	-	B	B	-	-	-	B	-	-	-

Table 1. (continued)
June 1976 - May 1982.

Species	Preferred Habitat	Distri- bution	Guild	Class- ifi- cation	Status	Evi- dence	Monthly Occurrence											
							Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Song Sparrow (<u>Melospiza melodia</u>)	CF,CG,RS, FG	1,-,3	3334	N	S(RH)	V	-	-	-	B	T	T	-	B	-	-	-	-
McCown's Longspur (<u>Calcarius mccownii</u>)	GR	-, -,3	3234	N	S(TO)	V	-	-	-	-	B	B	B	B	-	-	-	-
Lapland Longspur (<u>Calcarius lapponicus</u>)	CU,GR	1,2,3	1230	N	W	V	B	B	T	-	-	-	-	-	-	-	B	B
Chestnut-collared Longspur (<u>Calcarius ornatus</u>)	GR,CUI	1,2,3	3234	N	S(NE)	S(1)	-	-	-	B	B	B	B	B	B	T	-	-
Snow Bunting (<u>Plectrophenax nivalis</u>)	CU,GR	1,2,3	1230	N	W	V	B	B	T	-	-	-	-	-	-	B	B	B

Table 2. Summary of Inventory Data for Amphibian, Reptile, and Mammal Species Observed in the Circle West Study Area, June 1976-May 1982. (see text for explanation of abbreviations)

Species	Preferred Habitat	Distri- bution	Major Food Source	Class- ifi- cation	Evi- dence	Monthly Occurrence											
						Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
AMPHIBIANS																	
Tiger Salamander (<u>Ambystome tigrinum</u>)	RD,AF	-2,-	Worms,slugs, insects	N	P	-	-	-	-	-	B	-	-	-	-	-	-
Woodhouse's Toad (<u>Bufo woodhousei</u>)	SC,GR	1,-,-	Insects	N	S(1)	-	-	-	-	T	T	-	-	-	-	-	-
Great Plains Toad (<u>Bufo cognatus</u>)	SR,GR	-2,-	Insects	N	S(1)	-	-	-	-	T	B	-	-	-	-	-	-
Leopard Frog (<u>Rana pipiens</u>)	SM,PG	1,2,3	Insects	N	S(1)	-	-	-	B	B	B	B	T	-	-	-	-
Boreal Chorus Frog (<u>Pseudacris triseriata</u>)	PG	1,2,3	Insects	N	S(1)	-	-	-	B	B	B	B	-	-	-	-	-
REPTILES																	
Painted Turtle (<u>Chrysemys picta</u>)	PG,PM SM,RD	1,2,3	Aquatic plants & invertebrates	N	V	-	-	-	B	B	B	B	B	-	-	-	-
Short-horned Lizard (<u>Phrynosoma douglassi</u>)	BA	1,2,-	Insects	N	S(1)	-	-	-	-	-	B	-	-	-	-	-	-
Western Hognose Snake (<u>Heterodon nesicus</u>)	GR	-2,-	Rodents, frogs, young birds, insects	N	P	-	-	-	-	-	B	-	-	-	-	-	-
Racer (<u>Coluber constrictor</u>)	GR,RD	1,2,3	Rodents, frogs, young birds, insects	N	S(1)	-	-	-	-	B	B	B	-	-	-	-	-
Bullsnake (<u>Pituophis melanoLeucus</u>) AF,OF,PR	SA,BA, AF,OF,PR	1,2,3	Rodents, rabbits,N birds, eggs	N	P	-	-	-	-	B	B	B	-	-	-	-	-
Plains Garter Snake (<u>Thamnophis radix</u>)	SM,PR	1,2,3	Frogs, insects, N mice, earthworms	N	V	-	-	-	-	B	B	-	-	-	-	-	-

Table 2. (continued)
June 1976 - May 1982

Species	Preferred Habitat	Dietri- bution	Major Food Source	Class- ifi- cation	Evi- dence	Monthly Occurrence											
						Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Prairie Rattlesnake (<i>Crotalus viridis</i>)	GR,SG, SS	1,2,3	Rodents, frogs birds	N	S(1)	-	-	-	-	B	B	B	-	T	T	-	-
<u>MAMMALS</u>																	
Hayden Shrew (<i>Sorex haydeni</i>)	SM,TC	1,-,-	Invertebrates	N	S(2)	-	-	-	-	T	-	-	-	-	T	-	-
Marriam's Shrew (<i>Sorex merriami</i>)	HJ	1,-,-	Invertebrates	N	S(1)	-	-	-	-	-	-	-	-	-	B	-	-
Desert Cottontail (<i>Sylvilagus audubonii</i>)	LC,TC,SS, SG,AF	1,2,3	Grass, seeds, leaves, fruit	N	S(3)	B	B	-	B	B	B	B	B	B	B	B	B
White-tailed Jackrabbit (<i>Lepus townsendii</i>)	GR,SS,SG	1,2,3	Grasses, forbs, buds, twigs	N	P	B	B	-	B	B	B	B	B	B	B	B	B
Least Chipmunk (<i>Eutamias minimus</i>)	TC,LC,BA	1,2,3	Plants, seeds, fruits, insects	N	S()	-	-	-	-	T	B	B	B	B	B	T	-
13-lined Ground Squirrel (<i>Spermophilus tridecemlineatus</i>)	GR	1,2,3	Grass, seeds, insects	N	V	-	-	-	B	B	B	B	B	B	B	-	-
Black-tailed Prairie Dog (<i>Cynomys ludovicianus</i>)	GR	-2,3	Grasses, insects	N	S(2)	-	-	B	B	B	B	B	B	B	B	B	-
Northern Pocket Gopher (<i>Thomomys talpoides</i>)	GR,WM	1,2,3	Roots, grasses	N	S(1)	-	-	-	-	-	-	T	-	-	-	-	-
Wyoming Pocket Mouse (<i>Perognathus fasciatus</i>)	GR,SS	1,2,3	Seeds, grass	N	V	-	-	-	-	T	-	-	-	-	T	-	-
Beaver (<i>Castor canadensis</i>)	FW	1,2,3	Bark and twigs, green plants	F	R	-	-	-	-	T	T	-	-	-	-	-	-
Western Harvest Mouse (<i>Reithrodontomys megalotis</i>)	SC,GR,LS	1,2,3	Seeds, grass	N	S(2)	-	-	-	-	T	-	-	-	-	T	-	-

Table 2. (continued)
June 1976 - May 1982

Species	Preferred Habitat	Distri- bution	Major Food Source	Class- ifi- cation	Evi- dence	Monthly Occurrence											
						Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Deer Mouse (<u>Peromyscus maniculatus</u>)	Various	1,2,3	Seeds, grass, insects, fruits	N	S(12)	-	-	-	B	T	B	B	B	B	B	-	-
Bushy-tailed Woodrat (<u>Neotoma cinerea</u>)	SC	1,-,-		N	S(1)	-	-	-	-	-	T	-	-	-	-	-	-
Preirie Vole (<u>Microtus ochrogaster</u>)	SR	1,2,-	Grasses, seeds, insects	N	S(6)	-	-	-	-	T	-	-	-	-	T	-	-
Meadow Vole (<u>Microtus pennsylvanicus</u>)	SM	1,2,-	Grasses, seeds, insects	N	S(1)	-	-	-	-	T	-	-	-	-	T	-	-
Long-tailed Vole (<u>Microtus longicaudus</u>)	TC	1,2,-	Grasses, seeds, insects	N	S(1)	-	-	-	-	-	-	-	-	-	T	-	-
Muskrat (<u>Ondatra zibethicus</u>)	FW,SA	1,2,3	Aquatic plants and animals	F	V	-	-	B	B	B	B	B	B	B	B	B	-
House Mouse (<u>Mus musculus</u>)	OF	1,-,-		N		-	-	-	-	-	T	-	-	-	-	-	-
Porcupine (<u>Erethizon dorsatum</u>)	CG,CF,TC, LC,GR	1,2,3	Bark, buds, twigs, forbs	N	S(1)	T	B	B	-	T	B	B	B	B	B	B	B
Coyote (<u>Canis latrans</u>)	Various	1,2,3	Mice, rabbits, carrion, insects	P	S(1)	T	T	B	B	B	B	B	B	B	B	B	B
Red Fox (<u>Vulpes fulva</u>)	Various	1,2,3	Mice, rabbits, insects, fruit	N	V	T	B	B	T	-	B	B	B	B	B	B	B
Raccoon (<u>Procyon lotor</u>)	CF,BX,CU	1,2,3	Various	N	V	T	-	-	B	B	B	B	B	B	T	-	-
Long-tailed Weasel (<u>Mustela frenata</u>)	RD	1,2,3	Small rodents, birds	P	P	T	T	B	-	-	-	-	T	-	-	-	-
Mink (<u>Mustela vison</u>)	FW	-2,3	Fish, small mammals, birds	F	R	-	-	-	-	-	-	-	-	-	-	-	-

Table 2. (continued)
June 1976 - May 1982

Species	Preferred Habitat	Dietri- bution	Major Food Source	Classi- fifi- cation	Evi- dence	Monthly Occurrence											
						Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Badger (<u>Taxidea taxus</u>)	GR, BA	1,2,3	Rodents, rabbits	N	V	-	-	-	B	-	-	B	T	B	-	-	-
Striped Skunk (<u>Mephitis mephitis</u>)	Various	1,2,3	Insects, fruit eggs, carrion	P	V	-	-	B	B	B	B	B	B	B	-	-	T
Bobcat (<u>Lynx rufus</u>)	BA	1,2,-	Rabbits, ro- dents, birds	F	V	-	-	-	-	-	-	-	B	-	-	-	-
Mule Deer (<u>Odocoileus hemionus</u>)	See DNRC (1978)	1,2,3 See text	See DNRC (1978)	G	V	B	B	B	B	B	B	B	B	B	B	B	B
White-tailed Deer (<u>Odocoileus virginianus</u>)	See DNRC (1978)	1,2,3 See text	See DNRC (1978)	G	V	B	B	B	B	B	B	B	B	B	B	B	B
Pronghorn Antelope (<u>Antilocapra americana</u>)	See DNRC (1978)	1,2,3 See text	See DNRC (1978)	G	V	B	B	B	B	B	B	B	B	B	B	B	B

Guild (Birds Only). Breeding-season guilds (or nonbreeding-season guilds for winter residents and migrants) are indicated by a four-digit code. The first digit indicates major food source or feeding habits: 1 indicates seeds and vegetation (75% of diet); 2, invertebrates; 3, omnivorous (25-75% plant material); 4, vertebrates; 5, carrion. The second digit indicates foraging stratum: 1 indicates bark or bole; 2, ground, grass, and low shrubs; 3, tall shrubs or low forest canopy; 4, mid-to-high forest canopy or tall trees; 5, air; 6, water. The third digit indicates foraging strategy: 1 indicates bark or bole drilling; 2, bark or bole gleaning; 3, ground and brush foraging; 4, tree foliage foraging; 5, sallying; 6, raptorial; 7, dabbling or stalking in water; 8, diving in water; 9, mud probing; 0, soaring or swooping. The fourth digit indicates preferred nest site: 1 indicates cattails or bulrush; 2, shore, marsh, or water; 3, cliffs, caves, rims, badlands, buildings; 4, ground, grassland; 5, low shrub (less than 1 m or 3 ft); 6, tall shrub (1 m - 3 m or 3 ft-10 ft); 7, tree branch (greater than 3 m or 10 ft); 8, tree cavity; 9, underground burrow; 0, nonbreeding in study area.

Status (Birds Only). First letter denotes indicated status in the study area: M indicates spring and fall migrant only; R, permanent resident; S, summer resident; V, summer visitor (nonbreeding); W, winter resident. For permanent and summer residents, evidence for breeding is given in parentheses using a modification of Binford's (1973) categories which are, in order of decreasing conclusiveness: PJ indicates prejuvenal young observed; NY, nest with young; NE, nest with eggs; AN, active nest completed, contents unknown; NC, active nest completed but empty; UC, nest under construction; UN, active nest, condition unknown; AF, adult carrying food; AC, adult carrying nest material; CO, copulation observed; D, courtship display observed; TO, territoriality observed; RH, range, habitat, and dates; SS, observed in area outside breeding season (for sedentary or permanent resident species only). Only the most conclusive evidence obtained during this study is listed in the table.

Monthly Occurrence. The letter "B" indicates observations made during the baseline study period (DNRC 1978); the letter "T" indicates observations made during other years.

Table 3 summarizes the cumulative numbers of species observed in the study areas during the baseline study and through the first, second, third, and fourth monitoring periods. This table shows that two new vertebrate species were added to the species list as a result of the fourth year's monitoring; these are the bushy-tailed woodrat and house mouse.

Narrative Accounts for Selected Species

Data in addition to that in Tables 1 and 2 were obtained for certain key species, and are summarized in the following species accounts. Information presented here, limited for the most part to nesting raptors, upland game birds, and ungulates, primarily assesses changes that have occurred in the Mine Study Area since the baseline study. Additional data on all species are on file with DNRC.

Table 3. Summary of cumulative numbers of species observed in the Circle West study areas through May 1982.

	Baseline Study (through February 28, 1978)		Through First Monitoring Period (March 7, 1979)		Through Second Monitoring Period (Feb. 29, 1980)		Through Third Monitoring Period (Feb. 28, 1981)		Through Fourth Monitoring Period (Feb. 28, 1982)		Through Fifth Monitoring Period (May 1982)	
	PMA	MSA	REC ¹	PMA	MSA	REC	PA	MSA	REC	PA	MSA	REC
<u>AMPHIBIANS</u>												
Total number of Species	2	4	4	4	5	5	4	5	5	4	5	5
<u>REPTILES</u>												
Total number of Species	6	7	7	6	7	7	6	7	7	6	7	7
<u>BIRDS</u>												
Total number of Species (T)	79	109	139	101	132	160	109	141	164	122	149	169
Summer Residents (S)	56	68	85	66	75	92	69	80	93	76	83	94
Permanent Residents (R)	12	16	17	13	16	17	14	16	17	14	16	17
Non-breeding Summer Visitors (V)	2	2	3	3	5	5	3	5	5	4	6	6
Migrants (M)	6	16	24	15	29	36	18	33	39	21	36	41
Winter Residents (W)	4	7	10	4	7	10	5	7	10	7	8	11
Total Breeding Species (S&R)	68	84	102	79	91	109	83	96	110	90	99	111
<u>MAMMALS</u>												
Total number of Species	19	26	26	20	27	27	24	27	27	25	28	28
TOTAL VERTEBRATE SPECIES	106	146	176	131	171	199	143	180	203	160	191	211

¹ PMA=Proposed Mining Area; PA=Permit Area; MSA=Mine Study Area (now 113 sections, including PA);
REC=Reconnaissance Study Area (including MSA)

Red-tailed Hawk. Only two red-tailed hawk nests were known to be active in the Mine Study Area in 1981. The nest located 2.5 mi WSW of the Dreyer ranch house again fledged two young; the nest near stock pond MC10 (3.5 mi WNW of the Dreyer ranch house) contained at least two young. In May 1982 a pair were observed at the nest near MC10 and another pair were observed at the nest at NC31.

Swainson's Hawk. Only one Swainson's hawk nest was known to be active in 1981. This was a new nest located about 1 mi NE of the Waller ranch house. It fledged two young. A Swainson's hawk was observed in the area in May 1982. A pair were observed on the nest near lek #7 on Nelson Creek in May 1982.

Ferruginous Hawk. Three ferruginous hawk nests were known to be active in 1981. One, located near the 1979 nest site about 2 mi NNW of the Dreyer ranch house, fledged two young in 1981. Another, located near the 1977 nest site about 2 mi NW of the Waller ranch house, fledged one young bird. A third nest, newly occupied in 1981, was located about 2 mi SW of the Dreyer ranch house and fledged one young bird. A nest about 4 mi WSW of the Dreyer ranch house, which was active in 1979, was again unoccupied in 1981.

Golden Eagle. Neither of the two known golden eagle nest sites were active in 1981, although adults were seen near the 1977 nest site.

Marsh Hawk. Although territorial pairs were observed in many places within the Mine Study Area, only one nest is known to have fledged young in 1981. This nest site was located about 2.5 mi N of the Waller ranch house, and fledged at least one young bird.

Prairie Falcon. The 1977 nest site contained three young on June 20, 1981. At least one young bird was fledged.

American Kestrel. No active Kestrel nests were found in 1981.

Sharp-tailed Grouse. Spring 1981 counts of sharp-tailed grouse at known leks within the Mine Study Area were as follows: lek No. 6, six birds on March 25; No. 7, three birds on April 15; No. 13, 14 birds on March 25; No. 14, seven birds on March 25; and No. 15, seven birds on March 25. A new lek, No. 16, was discovered in the southeastern corner of S11, T20N, R45E; four birds were counted there on April 15, 1981.

April-May 1982 counts of sharp-tailed grouse were as follows: lek No. 5, eight males and two females; lek No. 6, 15 males; lek No. 7, seven males, two females; lek No. 14, eight males; lek No. 15, six unidentified birds; lek No. 16, 16 unidentified birds. No count was made at lek No. 17 (T20N, R45E, S34, SW $\frac{1}{2}$) in 1982. Four new leks were discovered in 1982. These are: lek No. 18, T20N, R45E, S20, SE $\frac{1}{4}$, eight males; lek No. 19, T20N, R45E, S7, NE $\frac{1}{4}$, eight males; lek No. 20, T20N, R45E, S7, SW $\frac{1}{4}$, five males; lek No. 21, T21N, R45E, S31, northcentral portion, five males. Birds were seen from the air in T19N, R45E, S24, but no count was made.

Sage Grouse. On April 15, 1981, 11 males were observed displaying at lek No. 4 (DNRC 1978). Five males were seen there in 1982, and 25 displaying males were also seen at lek No. 6, about 1 mile west-northwest of lek No. 4.

Ring-necked Pheasant. Figure 1 shows year-to-year changes in June sample abundances of ring-necked pheasants as sampled in five roadside wildlife surveys. Sample abundances did not differ significantly (t-test, $p > .20$) between 1980 and 1981.

Great Horned Owl. None of the previously used nest sites were known to be active in 1981.

Desert Cottontail. Results of the 1981 lagomorph survey are presented in Table 4 (see also Figure 2).

White-tailed Jackrabbit. The number of jackrabbits observed during the 1980 lagomorph survey (Table 4) does not differ significantly from the number observed in 1979 (t-test, $p > .20$) (Figure 2).

Mule Deer. A summary of mule deer observations during the study period is presented in Table 5. Production ratios obtained during the period 1977-1980 are shown in Figure 3. These were based on September-October data since summer foliage limits pre-September observations of fawns and since hunting mortality directly influences age structure in November populations.

Aerial census data are presented in Table 6. It should be emphasized that the low numbers of deer observed during the summer reflect decreased observability at this season and do not necessarily indicate a corresponding decrease in abundance. Since observability is highest in winter, both density and distribution estimates are based on the winter aerial census. Figure 4 shows winter density indices obtained since 1976. Since the census data in Table 6 represent the minimum number known to be present, the density indices shown in Figure 4 may be somewhat lower than true densities.

Monthly mule deer winter density indices obtained during aerial censuses were averaged for each of the 114 sections in the Mine Study Area for the winter of 1981-1982 and for all winters since 1976. These data were not used to create density index isopleths, as was done in previous years, but are presented in tabular form in Appendix D.

White-tailed Deer. A summary of white-tailed deer observations made during the study period is presented in Table 7.

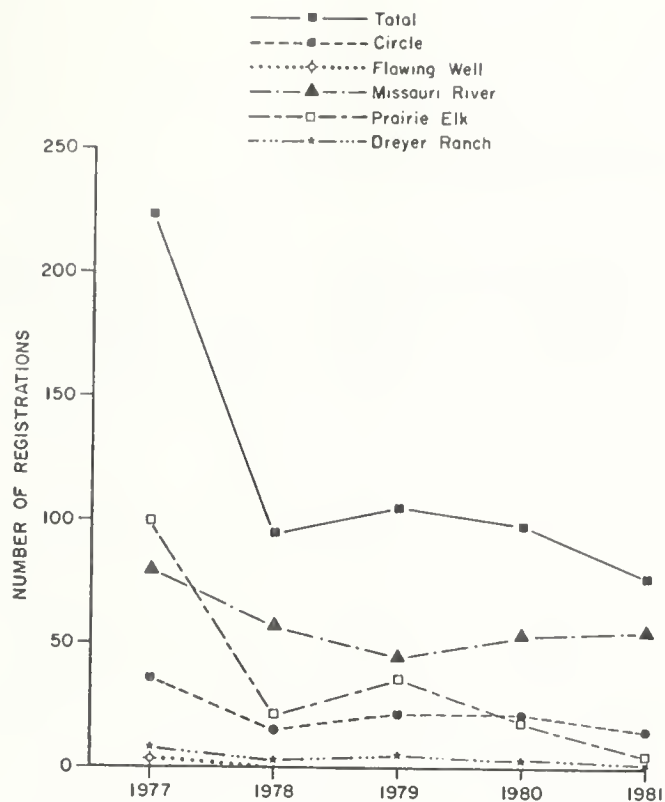


Figure 1. Year-to-year changes in June Sample abundance of ring-necked pheasant along five roadside wildlife survey routes, Circle West area.

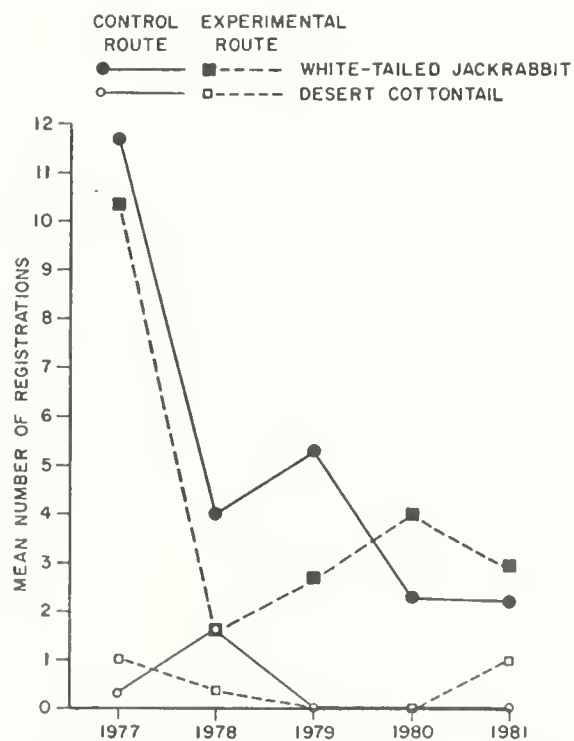


Figure 2. Year-to-year changes in lagomorph density indices, Circle West study area.

Table 4. Results of 1981 lagomorph survey,
Circle West study area.

Date	<u>Desert Cottontail</u>		<u>White-tailed Jackrabbit</u>	
	Control Route	Experimental Route	Control Route	Experimental Route
November 10, 1981	0	2	4	4
November 11, 1981	0	0	0	2
November 12, 1981	0	1	3	3
Mean	0.0	1.0	2.3	3.0

Table 5. Classification summary for mule deer observed in the Circle West area, March 1981 - May 1982.

Period	All Groups			Fully Classified Groups Only				Young/100 Females		Males/Females	
	Number of Groups	Group Size Average	Range	Total No. Observed	Total No. Classified	Total Adults	Adult Males	Adult Females	Young	Young/100 Adults	Young/100 Females
Spring 1981	115	5	1-28	594	89	85	0	85	4	-	-
Summer 1981	204	2	1-12	482	340	261	60	201	79	30.3	39.3
Fall 1981	108	4	1-26	477	385	237	49	188	148	62.4	78.7
Winter 1981-82	25	4	1-17	96	2	2	2	0	0	-	-
Spring 1982*	22	3	1-10	76	48	42	1	41	6	-	-

*ground observations only

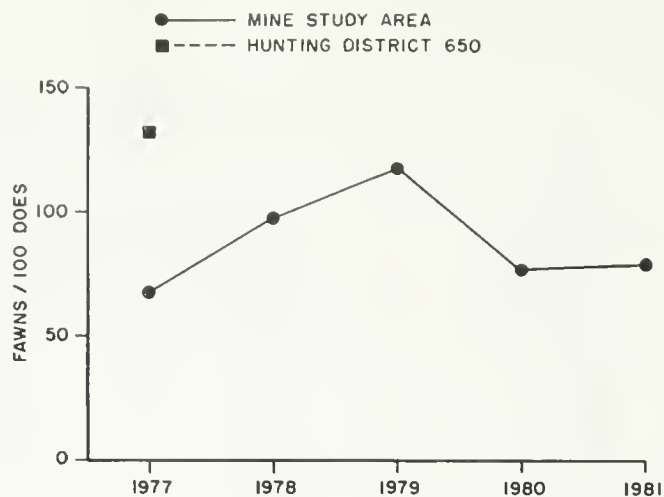


Figure 3. Year-to-year changes in mule deer production ratios, Circle West study areas (based on September-October ground and aerial survey data).

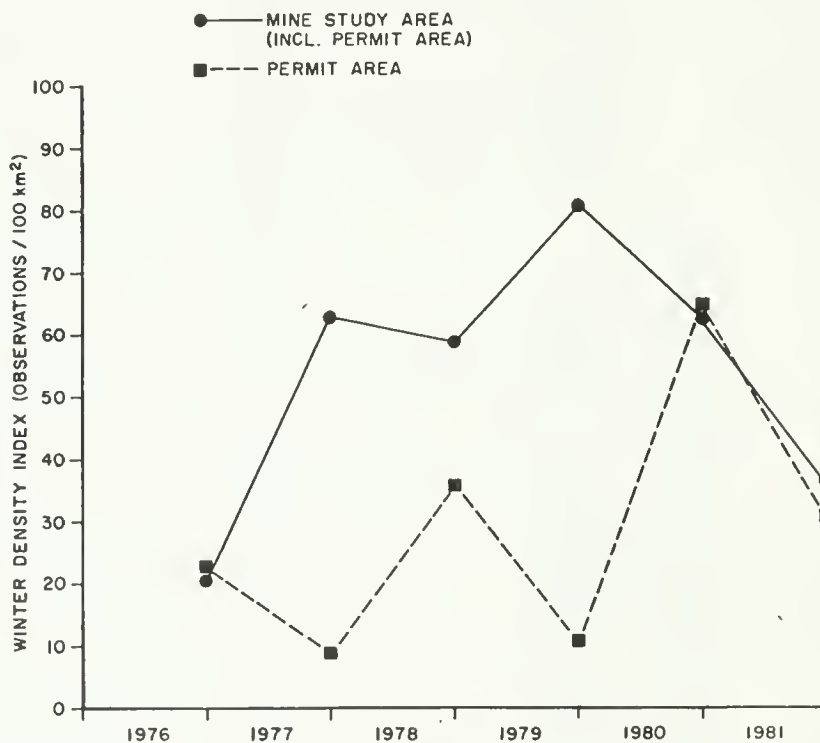


Figure 4. Year-to-year changes in the mule deer winter density index for the Circle West study areas (based on the month of the largest census obtained for the Mine Study Area during the winter season).

Table 6. Deer and Pronghorn aerial census data, Circle West area, March 1981 - January 1982.

Date	Observer	Mine Study Area ¹			Proposed Mining Area ²			Permit Area ³		
		Pronghorn	Mule Deer	White-tailed Deer	Pronghorn	Mule Deer	White-tailed Deer	Pronghorn	Mule Deer	White-tailed Deer
March 16, 1981	Stoneberg	193	171	22	0	6	0	0	45	0
April 23, 1981	Stoneberg	140	162	14	12	2	0	20	27	0
May 18, 21, 1982	Stoneberg	118	46	0	14	0	0	32	5	0
June 2, 1981	Stoneberg	130	127	8	6	9	0	16	30	0
July 8, 10, 13, 1981 ⁴	Stoneberg	264	N.C. ⁵	N.C.	48	N.C.	N.C.	69	N.C.	N.C.
August 10, 1981	Stoneberg	180	101	7	10	5	1	12	29	4
September 10, 1981	Stoneberg	177	203	18	4	0	0	17	26	0
October 15, 1981	Stoneberg	171	88	5	0	0	0	14	3	0
January 4-29, 1982	Stoneberg	40	107	0	0	9	0	0	24	0

1 293 km² (113 mi²); includes permit area and proposed mining area

2 30 km² (11.5 mi²)

3 78 km² (31.5 mi²)

4 Censuses conducted during survey of Hunting District 650

5 No counts of deer made during this census

Table 7. Classification summary for white-tailed deer observed in the Circle West area, March 1981 - May 1982.

Period	All Groups			Total No. Observed	Classified Groups Only			
	Number of Groups	Group Size			Total Number Classified	Adult		Young
		Average	Range			Males	Females	
Spring 1981	19	3	1-8	64	9	0	9	0
Summer 1981	37	2	1-5	70	61	22	28	11
Fall 1981	6	4	2-6	23	18	9	4	5
Winter 1981-82	0	0	-	0	0	-	-	-
Spring 1982*	1	2	2-2	2	2	-	2	-

*ground observations only

Pronghorn. A summary of pronghorn observations made during the study period is presented in Table 8. Production ratios for the Mine Study Area from 1977-1980 (based on all July through October observations of fully classified groups) are shown in Figure 5. Results of the July 1981 pronghorn aerial census of Hunting District 650 are presented in Table 9. Aerial census data for the Mine Study Area are presented in Table 6. Winter density indices (as described under Mule Deer, above) and summer-fall density indices (based on the largest aerial census figures obtained during a single flight in the period from July-October) are shown in Figure 6 for 1977-1981.

Monthly pronghorn summer and winter density indices obtained during aerial censuses were averaged for each section in the Mine Study Area for the report period as well as for all years since 1976 combined. These data were not used to create density index isopleths, as was done in previous years, but are presented in tabular form in Appendix D.

BIRD COMMUNITY PARAMETERS

Waterfowl Communities

Breeding season species composition of all waterfowl and other large water birds observed in the Mine Study Area is presented in Table 10. Year-to-year changes in waterfowl species composition are portrayed graphically in Figure 7. Species composition was remarkably similar to that noted in 1979, with the mallard again being the predominant breeding waterfowl species.

Waterfowl breeding season census data for stockponds in the study area are summarized in Table 11. These data are converted to production and density estimates in Table 12. Production is shown graphically in Figure 8. Note that breeding pair censuses are not a reliable indicator of production as shown by Figure 8. In 1980, the number of pairs was comparable to the number censused in 1979, but actual production dropped sharply, due to a decrease in residual grass cover. The 1979 peak in production was probably related to the excellent residual nesting cover following the extremely wet year of 1978.

Waterfowl data obtained during the roadside surveys are shown in Figure 9. Data on broods observed during 1981 are presented in Table 13.

Roadside Wildlife Survey

Data obtained during the 11 roadside surveys conducted in 1981 are presented in Appendix C. The cumulative numbers of species observed during all May-July runs (1977-1981) are presented in Table 14.

Table 15 summarizes 1980-1981 changes in May-July sample abundances of selected species, based on data obtained during runs of five roadside survey routes. Figure 1, which shows year-to-year changes in sample abundances of ring-necked pheasants, exhibits the type of graphs that were prepared to monitor individual species.

Table 8. Classification summary for pronghorn observed in the Circle West area, March 1981 - May 1982.

Period	All Groups			Fully Classified Groups Only								
	Number of Groups	Group Size		Total No. Observed	Total No. Classified	Total Adults	Adult		Young Adults	Young/ 100 Females	Males/ Females	
		Average	Range				Males	Females				
Spring 1981	161	5	1-25	785	96	96	44	52	0	-	-	
Summer 1981	184	5	1-22	1006	929	601	235	366	328	54.6	89.6	
Fall 1981	66	8	1-35	528	51	50	28	22	1	-	-	
Winter 81-82	3	17	1-28	52	0	-	-	-	-	-	-	
Spring 1982*	12	9	1-30	107	74	74	13	61	-	-	-	

*ground observations only

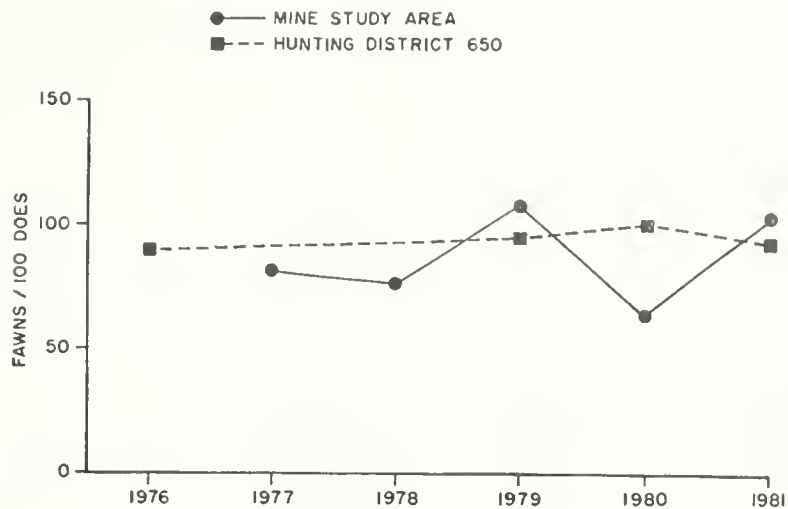


Figure 5. Year-to-year changes in pronghorn production ratios, Circle West study areas (based on July-October ground and aerial survey data).

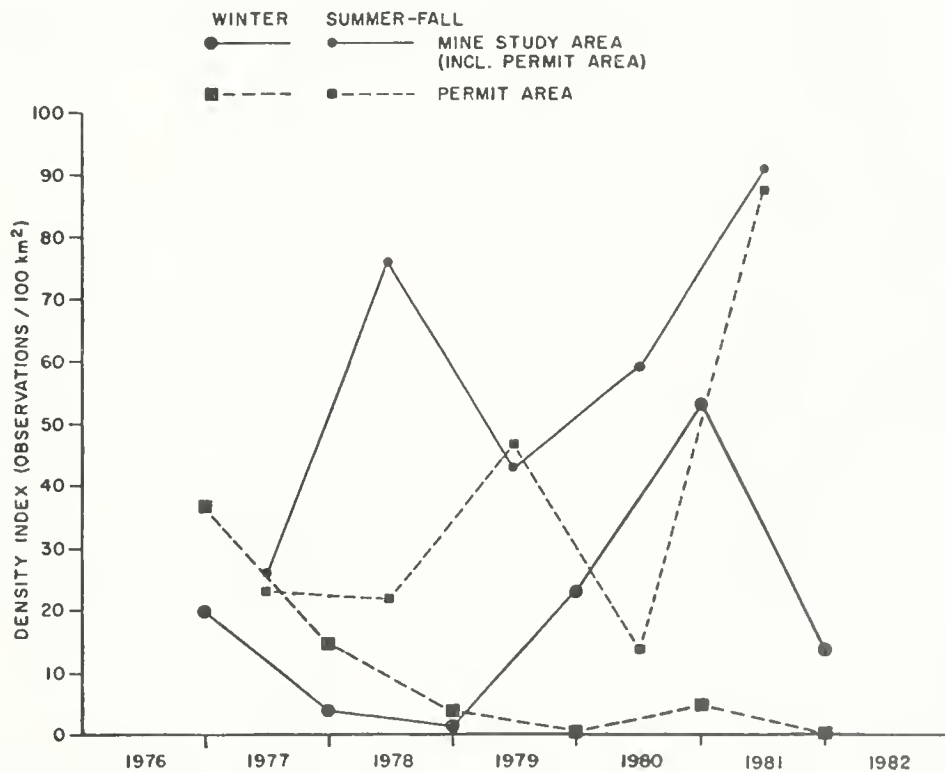


Figure 6. Year-to-year changes in pronghorn summer and winter density indices for the Circle West study areas (based on the largest aerial censuses obtained for the Mine Study Area during July-October and December-February respectively).

Table 9. Summary of July 1981 pronghorn aerial census, Hunting District 650.

Census Unit ¹	Bucks		Does	Fawns	Total	Bucks/ 100 does	Fawns/ 100 does
	Adult	Yearling					
1	3	5	34	19	61	24	56
2	3	6	15	14	38	60	93
3	9	6	35	26	76	43	74
4	26	14	78	76	194	51	97
5	21	8	35	24	88	83	69
6	26	12	79	77	194	48	97
7	14	29	73	74	190	59	101
8	11	8	53	43	115	36	81
9	20	13	66	70	169	50	106
10	4	4	13	9	30	62	69
11	29	14	93	103	239	46	111
12	68	43	157	154	422	71	98
13	26	33	85	85	229	69	100
Total	260	195	816	774	2045	56	95

¹Units 9, 11, and 12 include portions of the Mine Study Area.

Table 10. Species composition of all recorded waterfowl and large water bird observations in the 113-section Mine Study Area during the breeding season (May-July), 1980-1981, and during May 1982.

	May-July 1980	May-July 1981	May (only) 1982
<u>Ducks and Geese</u>			
Canada Goose	16(1) ¹	59(6)	2(1)
Mallard	722(45)	474(48)	85(32)
Gadwall	78(5)	52(5)	6(2)
Pintail	66(4)	28(3)	16(6)
Green-winged Teal	89(6)	9(1)	6(2)
Blue-winged Teal	273(17)	68(2)	61(23)
Cinnamon Teal	1(tr)	2(tr)	-
American Wigeon	222(14)	188(19)	28(10)
Northern Shoveler	57(4)	36(4)	25(9)
Redhead	2(tr)	6(1)	4(1)
Ring-necked Duck	-	1(tr)	-
Canvasback	6(tr)	29(3)	10(4)
Lesser Scaup	36(2)	28(3)	24(9)
Ruddy Duck	20(1)	6(1)	1(tr)
Total Classified	1588(100)	986(100)	268(100)
Total Unclassified	392	57	15
Grand Total	1980	1043	283
<u>Other Large Water Birds</u>			
Common Loon	1	-	-
Horned Grebe	-	6	-
Eared Grebe	55	37	49
Western Grebe	2	2	1
Pied-billed Grebe	18	-	5
White Pelican	15	71	6
Double-crested Cormorant	37	46	41
Great Blue Heron	16	12	3
Black-crowned Night Heron	1	-	-
Sandhill Crane	-	24	-
American Coot	12	27	21
American Avocet	-	-	2
Wilson's Phalarope	184	73	237
Ring-billed Gull	12	-	-
California Gull	-	11	2
Common Tern	1	14	9
Black Tern	22	4	50
Belted Kingfisher	1	-	1

¹ Numbers observed (percent of all waterfowl identified to species).

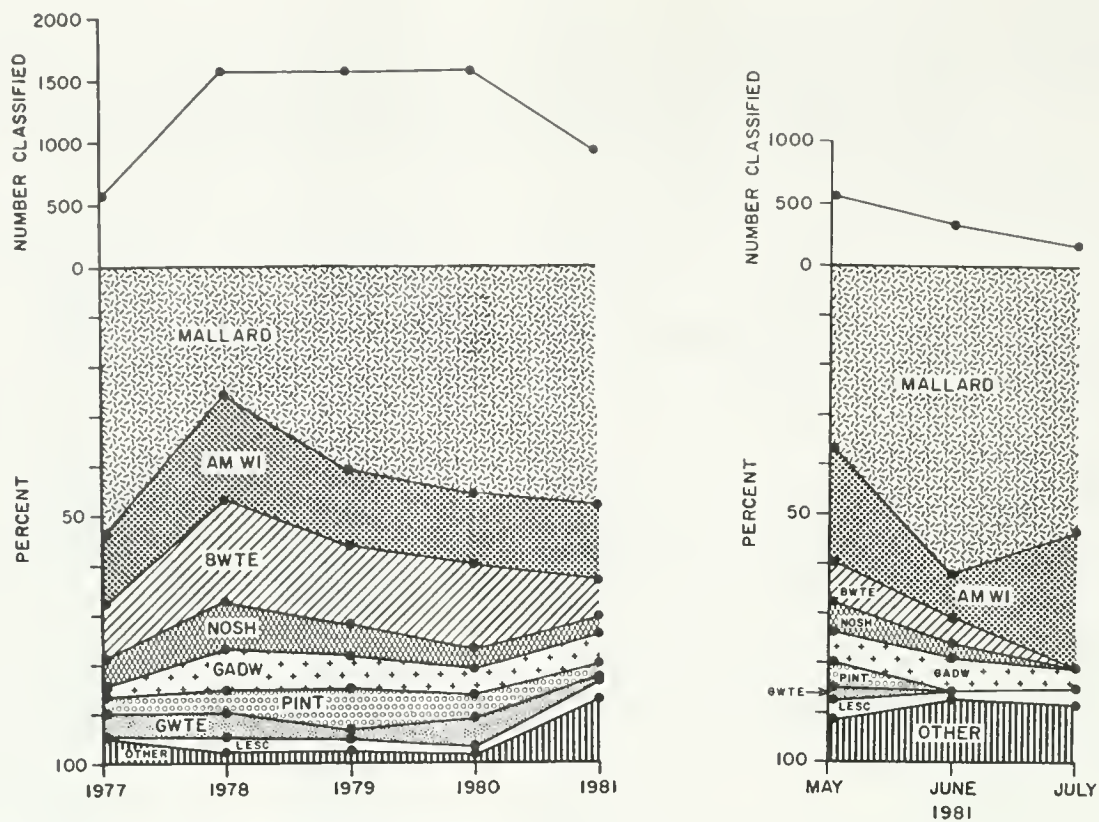


Figure 7. Percent species composition of all recorded 1981 waterfowl observations, Circle West study area (1977-1981 changes also shown).

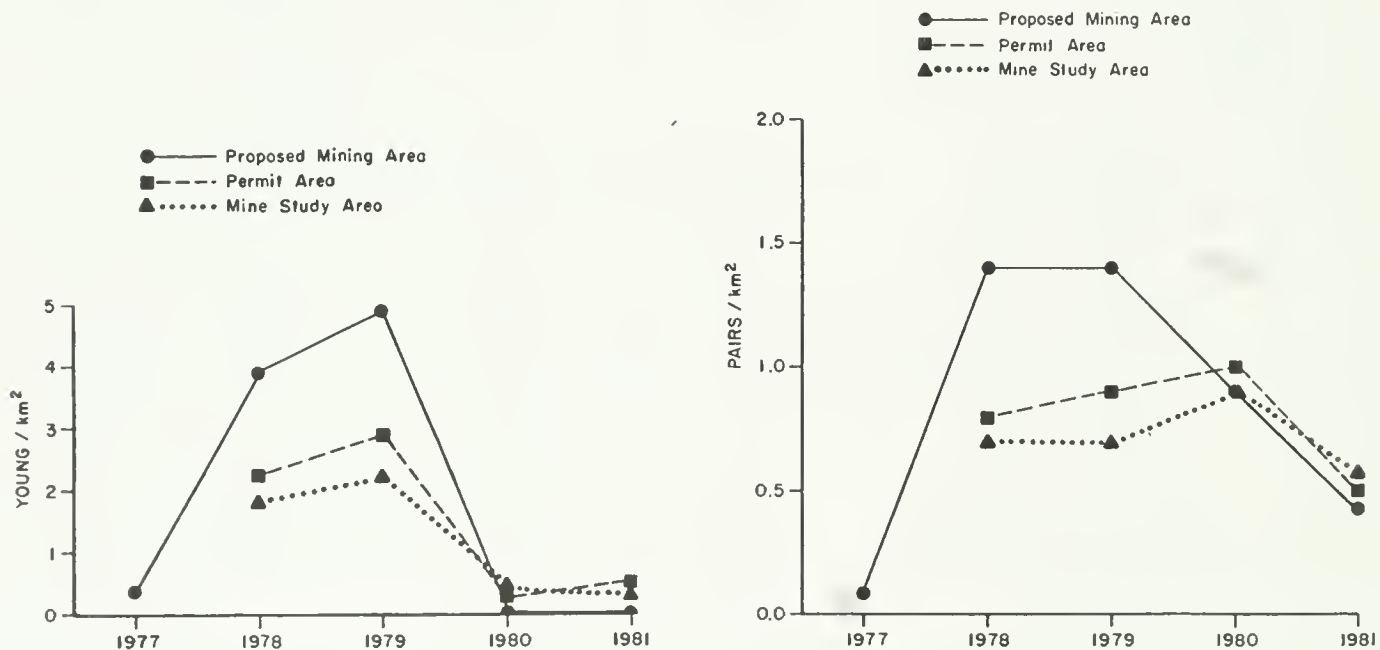


Figure 8. Year-to-year changes in waterfowl production, Circle West study areas.

Table 11. Summary of waterfowl breeding season census data for stockponds in the Circle West Mine Study Area, 1981

Species	Proposed Mining Area ¹	Permit Area ²	Mine Study Area ³
Mallard	12(0,0) ⁴	31(6,27)	107(11,46)
Gadwall	1(0,0)	1(0,0)	8(1,7)
Pintail	0(0,0)	4(0,0)	16(0,0)
Blue-winged Teal	0(0,0)	1(0,0)	8(0,0)
American Wigeon	0(0,0)	1(1,6)	13(6,27)
Northern Shoveler	0(0,0)	0(0,0)	3(0,0)
Redhead	0(0,0)	0(0,0)	4(0,0)
Lesser Scaup	0(0,0)	1(1,4)	1(1,4)
Ruddy Duck	0(0,0)	0(0,0)	2(0,0)
Unidentified Duck	0(0,0)	0(1,3)	1(5,17)
TOTAL ANATIDAE	13(0,0)	39(9,40)	168(24,101)

¹Includes stockponds Nos. MA01-10, MAFV, and MASW

²Includes all ponds in proposed mining area plus: MC05-08, NC10, 11, 13-15, 21, 23, 24, 27, 31

³Includes all ponds in 113-section area

⁴Minimum number of indicated pairs (number of broods, minimum number of young known present)

Table 12. Summary of 1981 waterfowl production data,
Circle West study area.

	PMA ⁶	PA ⁶	MSA ⁶
No. Stockponds Visited	10	24	54
No. Stockponds Censused	10	24	54
Area Censused ¹	30(11.5)	78(31.5)	293(113)
Water Area Censused ²	2.0(7.5)	9.0(22.5)	26.0(64.0)
Minimum No. Pairs ³	13	39	168
No./Total Area Censused ⁴	0.4(1.1)	0.5(1.2)	0.6(1.5)
No./Water Area Censused ⁵	4.3(1.7)	4.3(1.7)	6.5(2.6)
Broods	0	9	24
No./Total Area Censused ⁴	0	0.1(0.3)	0.1(0.2)
No./Water Area Censused ⁵	0	1.0(0.4)	0.9(0.4)
Young	0	40	101
No./Total Area Censused ⁴	0	0.5(1.3)	0.3(0.9)
No./Water Area Censused ⁵	0	4.4(1.8)	3.9(1.6)

¹km² (mi²)

²ha (acres)

³including brood data

⁴km⁻² (mi⁻²)

⁵ha⁻¹ (acres⁻¹)

⁶PMA=Proposed Mining Area (11.5 sections): PA=Permit Area; MSA=Mine Study Area (113 sections)

Table 13. Average sizes of waterfowl broods recorded in the
Mine Study Area during 1981.

Mallard	3.7(1-7,n=11)
Gadwall	7.0(n=1)
American Wigeon	4.5(1-7,n=6)
Lesser Scaup	4.0(n=1)

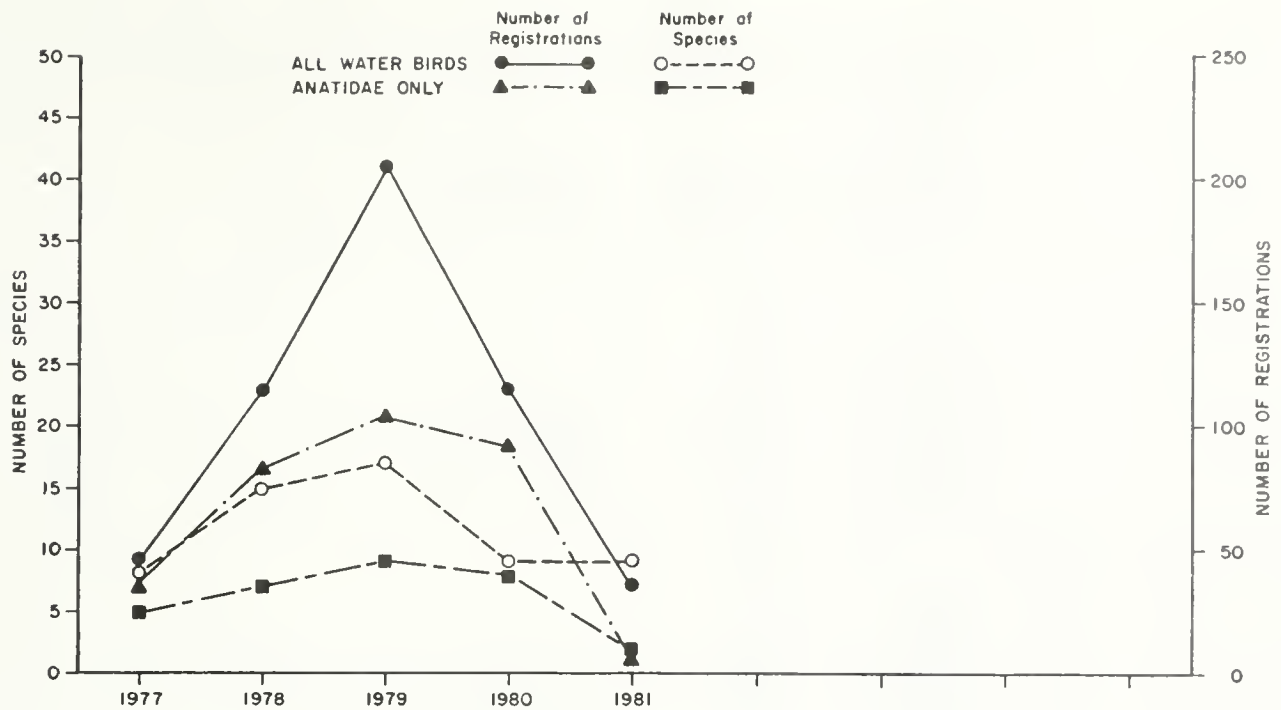


Figure 9. Year-to-year changes in numbers of species and numbers of registrations of water birds recorded on June runs of five roadside wildlife survey routes, Circle West study area.

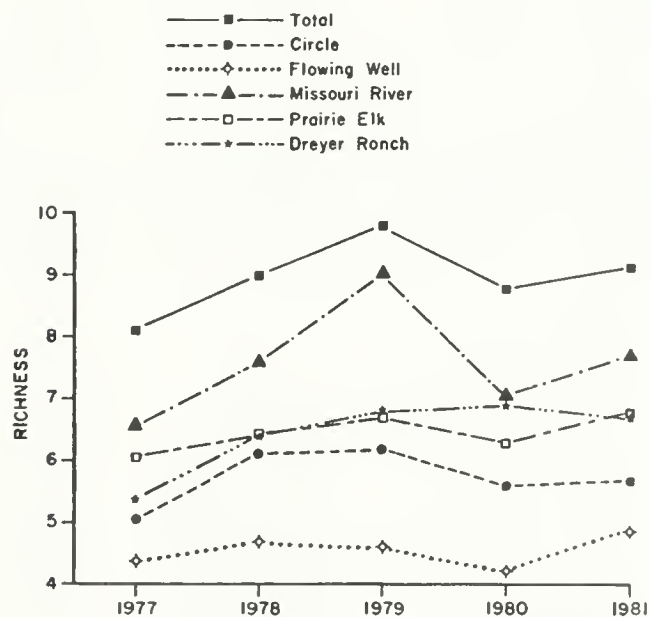


Figure 10. Year-to-year changes in June breeding bird species richness for five roadside wildlife survey routes, Circle West study area.

Table 14. Summary of cumulative numbers of species observed during May through July roadside counts, Circle West study area.

	Baseline Study (1977 runs), Five routes	Through First Monitoring Period (1977-1978 runs), Five routes	Through Second Monitoring Period (1977-1979 runs), Five routes	Through Third Monitoring Period (1977-1980 runs), Five routes	Through Fourth Monitoring Period ² (1977-1981 runs), Five routes
<u>AMPHIBIANS</u>					
Total number of Species	2(50.0) ¹	2(40.0)	2(40.0)	2(40.0)	2(40.0)
<u>REPTILES</u>					
Total number of Species	1(14.3)	1(14.3)	1(14.3)	1(14.3)	1(14.3)
<u>BIRDS</u>					
Total number of Species(T)	88(66.3)	110(68.8)	114(69.5)	115(68.5)	116(68.6)
Summer Residents(S)	72(84.7)	84(91.3)	85(91.4)	85(90.4)	85(90.4)
Permanent Residents(R)	15(88.2)	16(94.1)	16(94.1)	16(94.1)	16(94.1)
Non-breeding Summer Visitors(V)	1(33.3)	1(20.0)	3(60.0)	3(50.0)	4(66.7)
Migrants(M)	0(0.0)	9(25.0)	10(25.6)	11(26.8)	11(26.8)
Winter Residents(W)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)
Total Breeding(S&R)	87(85.3)	100(91.7)	101(91.8)	101(91.0)	101(91.0)
<u>MAMMALS</u>					
Total number of Species	14(53.9)	15(55.6)	15(55.6)	15(53.6)	15(50.0)
<u>TOTAL VERTEBRATE SPECIES</u>	105(59.7)	128(64.3)	132(65.0)	133(63.9)	133(63.0)

¹Number of species (percentage of cumulative totals for reconnaissance study area, Table 3).

²Of the five routes, only the Dreyer Ranch route was run in July 1981.

Table 15. Summary of 1980-81 changes in May-July sample abundances of selected species sampled by five roadside survey routes, Circle West study area.¹

Species	1980-81 Change ²
Sharp-tailed Grouse	NS
Ring-necked Pheasant	NS
Killdeer	NS
Mourning Dove	NS
Common Nighthawk	NS
Eastern Kingbird	NS
Horned Lark	NS
Black-billed Magpie	NS
Rock Wren	NS
Brown Thrasher	NS
Sprague's Pipit	I*
Loggerhead Shrike	NS
Yellow Warbler	NS
Common Yellowthroat	NS
House Sparrow	NS
Western Meadowlark	NS
Red-winged Blackbird	NS
Rufous-sided Towhee	NS
Lark Bunting	NS
Savannah Sparrow	NS
Grasshopper Sparrow	NS
Baird's Sparrow	I*
Vesper Sparrow	NS
Brewer's Sparrow	NS
Chestnut-collared Longspur	NS

¹Information for all 5 routes for May and June only; Dreyer route only for July.

²NS=no significant change; D=significant decrease; I=significant increase

*.01 < P < .05 (paired t-test)

**P < .01

Year-to-year changes in bird species richness, logarithmic standard deviation (σ), and number of species (excluding visitors, migrants, and water birds) for June runs of the five roadside survey routes are shown in Figures 10-12. Note that the relative positions of the routes on these graphs remain fairly constant from year to year.

SMALL MAMMAL COMMUNITY PARAMETERS

Small mammal capture data for 1981 are summarized in Table 16.

Figure 13 shows year-to-year changes in small mammal biomass for six habitats (biomass estimates obtained for control and experimental sites were averaged for combined spring and fall data). It should be noted that 1977 data are not strictly comparable, since a spring-fall trapping regime was not used that year.

Figure 14 shows year-to-year changes in the spring-fall small mammal biomass increase (which is related to production) for the same four habitats.

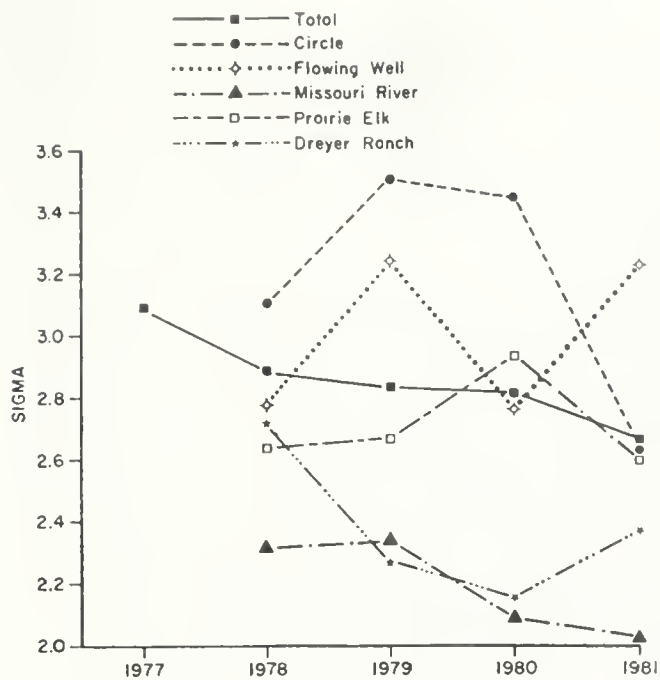


Figure 11. Year-to-year changes in June breeding bird community sigma for five roadside wildlife survey routes, Circle West study area.

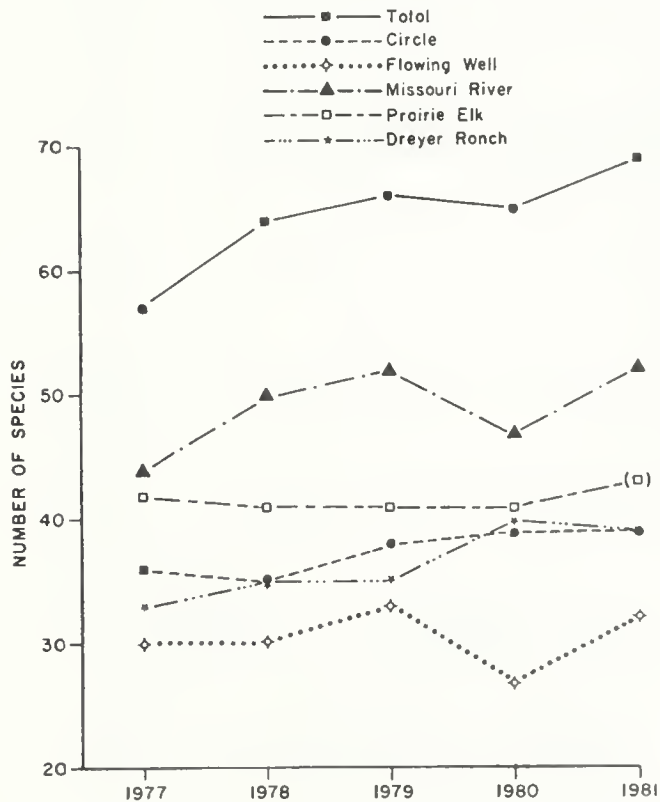


Figure 12. Year-to-year changes in June breeding bird species number (exclusive of summer visitors and water birds) for five roadside wildlife survey routes, Circle West study area.

Table 16. Summary of Small Mammal Trapping Data
Circle West Study Area, May - October 1981.

Habitat Category Treatment ¹	Blue grama-Needle-and- thread Grassland		Western Bulrush		Silver Sagebrush		Tall Coulee Shrubbery		Coulee Trunk		Scoria		Totals
	C	E	C	E	C	E	C	E	C	E	C	E	
Location Number	17	34	15	20	33	18	44	35	49	48	47	46	all
Number of trapnights (TN)	300	300	300	300	300	300	300	300	300	300	300	300	3600
Trapping Schedule ²	5/10	5/10	5/10	5/10	5/10	5/10	5/10	5/10	5/10	5/10	5/10	5/10	----
Captures/100 TN													
Deer Mouse	2.30	0.67	----	1.00	3.00	3.33	18.67	1.33	12.00	13.00	7.67	6.33	5.78
Least Chipmunk	----	----	----	----	----	----	----	----	----	0.33	----	----	0.03
Bushytailed Woodrat	----	----	----	----	----	----	----	----	----	----	----	0.67	0.06
Total Captures/100 TN	2.30	0.67	----	1.00	3.00	3.33	18.67	1.33	12.00	13.33	7.67	7.00	5.8
Number of Species	1	1	0	1	1	1	1	1	1	2	1	2	3
Biomass (g/100 TN)	59.00	16.83	0	18.00	54.00	68.50	341.33	20.67	228.33	253.17	152.67	309.33	126.82
Biomass Increase (g/100 TN) ³	-54.00	33.67	0	-36.00	20.00	-69.67	176.00	41.33	84.67	-47.00	40.00	-248.00	-4.92

¹C = Control; E = Experimental

²Month of first trapping/Months of last trapping

³Change in biomass between May and September/October sampling - (September/October biomass - May biomass) ÷ 1.50

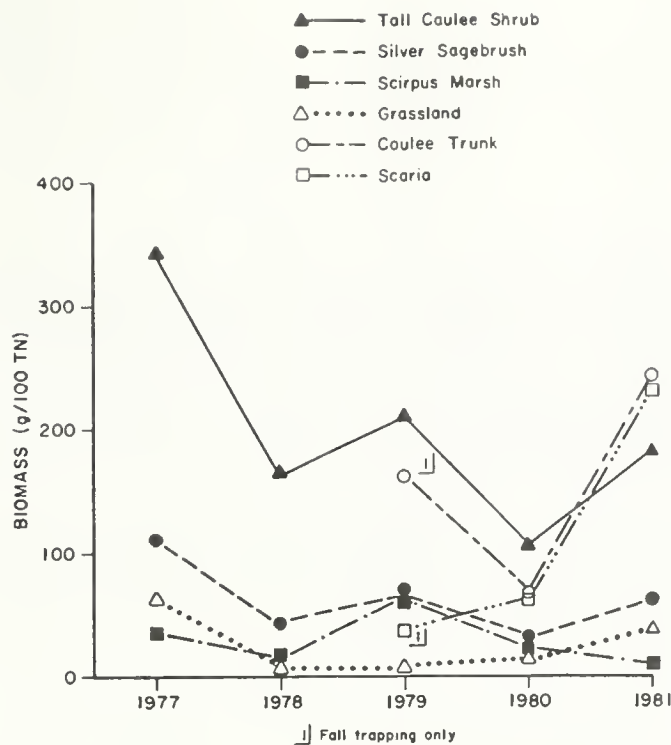


Figure 13. Year-to-year changes in small mammal biomass for six habitats sampled in the Circle West study area (control and experimental data are averaged for combined spring-fall data for each habitat).

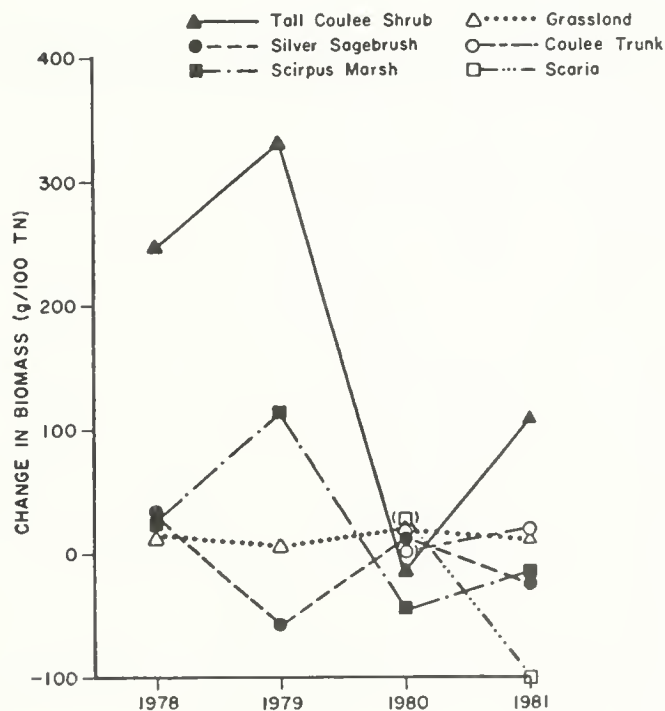


Figure 14. Year-to-year changes in spring-fall small mammal biomass change for six habitats sampled in the Circle West study area (control and experimental data are averaged for each habitat).

LITERATURE CITED

- Binford, L.C. 1973. A short method for treating avian breeding data in regional accounts. *Wilson Bull.* 85:244-246.
- Montana Department of Natural Resources and Conservation. 1978. Circle West wildlife baseline study. Final report. Circle West Tech. Report No. 2, Helena, MT.
- _____. 1979. Circle West wildlife monitoring study. First annual report. Circle West Tech. Report No. 4, Helena, MT.
- _____. 1980. Circle West wildlife monitoring study. Second annual report. Circle West Tech. Report No. 6, Helena, MT.
- _____. 1981. Circle West wildlife monitoring study. Third annual report. Circle West Tech. Report No. 7, Helena, MT.
- Montana Department of Fish, Wildlife and Parks. 1977. Montana Fish and Game Laws, 1977. Helena, MT.
- Prodgers, R. 1982. Circle West vegetation monitoring study: third annual report. Circle West Tech. Report No. 8. Mont. Dept. Nat. Res. Cons., Helena, MT.
- Tate, J., Jr. 1981. The Blue List for 1981. *Amer. Birds* 35:3-10.

ACKNOWLEDGMENTS

During the 1980-81 monitoring period, data were gathered by: John Bevins of OEA Research (small mammal trapping, waterfowl census, and general ground survey); Ron Stoneberg, MDFWP (aerial big game census, upland game bird lek counts); Larry Thompson, DNRC (project coordination, roadside wildlife surveys, waterfowl census, and general ground surveys); and Pat Nichols, DNRC (ground surveys and waterfowl censuses). George Cawlfeld, Chris Raver, Pat Nichols, and Larry Thompson of DNRC performed the data analysis. Joanne Brown typed the manuscript, and June Virag and Dan Nelson produced the graphics. Don Howard of DNRC's Cartography Bureau prepared the front cover illustration. This report was prepared by Larry Thompson and Pat Nichols of DNRC and was funded by Meridian Land and Minerals Co. The report was edited by William Phippen, DNRC. Special thanks are extended to the Mike McKeever family for help in the field.

APPENDIX A. Schedule of March 1981-May 1982 field work (exclusive of aerial surveys), Circle West Wildlife Monitoring Study (NOTE: See Table 6 for schedule of aerial surveys).

Date	Observer(s)	Type of Field Work	Approximate No. Person- Days
March 24-27	JB ¹	Ground surveys, lek counts	5
April 14-16	JB,LT(1 day)	Ground surveys, lek counts	5
May 21-26	LT(6 days)	Ground surveys, waterfowl census raptor nest census, roadside wildlife survey, lek counts	6
May 14-20	JB	Ground surveys, waterfowl census, raptor nest census, small mammal trapping	8
June 25-30	LT	Ground surveys, waterfowl census, raptor nest census, roadside wildlife survey	6
June 18-22	JB	Waterfowl census	6
July 20-23	LT,JB	Ground surveys, waterfowl census, raptor nest census, roadside wildlife survey	8
August 25-27	JB	Ground surveys, waterfowl census, raptor nest census, roadside wildlife survey	4
Sept 27-Oct 2	JB	Ground surveys, small mammal trapping	7
Nov 10-12	JB	Ground surveys, lagomorph survey	4
Jan 29-Feb 2	LT,PN	Ground surveys, coulee transects, coulee snow depths	10
Apr 6-8	PN	Ground surveys, coulee transects	4
May 22-24	PN	Ground surveys, coulee transects, waterfowl census	4
TOTAL			77

¹JB=John Bevens, LT=Larry Thompson, PN=Pat Nichols

APPENDIX B

Wildlife Habitat Categories, Circle West Baseline Wildlife Study.

Hoodland Series	Sirubland Series	Grassland Series	Wetland Series	Agricultural Land Series	Rights-of-Way Series	Towns and Communities	Badlands Series
CF - Cottonwood Forest	TC - Tall Coulee Shrub	LB - Little Blue-Stem	WM - Wet Meadow	GS - Grain, Sprouting	FR - Fence Row	TO - Towns	SC - Scoria
FG - Farm Groves and Shelter Belts	LC - Low Coulee Shrub	SA - Saltgrass	CM - Cattail Marsh	GI - Grain, Intermediate	HI - Highway Embankment	OF - Occupied Farmstead	BA - Badlands Complex
BX - Box elder/Ash	SR - Snowberry/Rose	GR - Grassland	SM - Scirpus Marsh	GM - Grain Mature	RD - County Road Embankment	AF - Abandoned Farmstead	BE - Bare Earth
CG - Cottonwood Groves (scattered trees)	BS - Big Sage 1/ BG - Big Sage Grassland 2/ SS - Silver Sage 1/ SG - Silver Sage Grassland 2/ RS - Riparian Shrubbery YU - Yucca WJ - Willow RJ - Rocky Mt. Juniper	BW - Bluebunch Wheatgrass HJ - Horizontal Juniper HW - Western Wheatgrass	PR - Stockponds and Reservoirs AP - Alkali Ponds PG - Pond (Grass bordered) PM - Pond (Marsh bordered) PW - Pond (Woodland bordered) SH - Shore SW - Still Water FW - Flowing Water	ST - Stubble FA - Fallow AL - Alfalfa WH - Wild Hayland CU - Cultivated (Undifferentiated)	TL - Transmission/Telephone Line Right-of-way		

1/ > 25% canopy cover.
2/ < 25% canopy cover.

APPENDIX C. Summary of bird community parameters for five roadside survey routes.

NOTE: Results are given for each of the five routes (indicated by the first letter of the route name as follows: C=Circle, F=Flowing Well, P=Prairie Elk, M=Missouri River, D=Dreyer Ranch, W=Waller Ranch), and for all five routes combined (including the Dreyer Ranch Route). Numbers indicate sample abundance and frequency for each species (e.g. 12/7 indicates that twelve birds were recorded at seven stops).

MAY 1981		(65)	(69)	(72)	(75)	(78)	(81)	(84)	(88)
Species	AOU	ROUTE						TOTAL INCL. D	
		C	F	P	M	D			
PIED-BILLED GREBE . .	006								
DBL-CR. CORMORANT	120								
GREAT BLUE HERON .	194								
BLK-CR. NIGHT HERON	202								
AM. BITTERN	190								
MALLARD	132	2/1	5/2		5/3	23/7		35/13	
GADWALL	135					9/2		9/2	
PINTAIL	143					4/1		4/1	
GREEN-WINGED TEAL	139					5/1		5/1	
BLUE-WINGED TEAL .	140		1/1		3/1	6/1		10/3	
AM. WIGEON	137		1/1			13/3		14/4	
N. SHOVELER	142					5/1		5/1	
WOOD DUCK	144								
REDHEAD	146								
CANVASBACK	147								
LESSER SCAUP	149								
RUDDY DUCK	167								
RED-TAILED HAWK .	337								
SWAINSON'S HAWK .	342	1/1			1/1	1/1		3/3	
FERRUGINOUS HAWK .	348				1/1			1/1	
MARSH HAWK	331			2/2		1/1		3/3	
AM. KESTREL	360		1/1	1/1	5/5			7/7	
SHARP-TAIL. GROUSE	308			2/1	4/2	1/1		7/4	
BOBWHITE	289								
RING-NECK PHEASANT	3091	17/4		34/21	61/31	3/3		117/75	
GRAY PARTRIDGE . .	2881								
SORA	214				2/1			2/1	
AM. COOT	221					9/1		9/1	
KILLDEER	273	5/5	7/6	23/21	14/10	13/10		62/52	
COMMON SNipe . . .	230								
LONG-BILLED CURLEW	264				1/1			1/1	
UPLAND SANDPIPER .	261			1/1	4/4			5/5	
SPOTTED SANDPIPER .	263								
WILLET	258					1/1		1/1	
MARBLED GODWIT . .	249								
AM. AVOCET	225								
WILSON'S PHALAROPE	224			3/1		17/1		20/2	
RING-BILLED GULL . .	054								
FRANKLIN'S GULL . .	059								
BLACK TERN	077								
ROCK DOVE	3131	1/1						1/1	
MOURNING DOVE . .	316	13/12	36/22	56/20	46/25	29/2		177/101	
YELLOW-BIL. CUCKOO	387								
BLACK-BILL CUCKOO	388								
GREAT HORNED OWL	375			1/1	1/1			2/2	
HURROWING OWL . .	378								
SHORT-EARED OWL . .	367								
COMMON NIGHT HAWK	420								
CHIMNEY SWIFT . . .	423								
BELTED KINGFISHER .	390								
COMMON FLICKER . .	412			3/3	7/7			10/10	
RED-HD. WOODPECKER	406				3/1			3/1	
HAIRY WOODPECKER	393								
DOWNY WOODPECKER	394								
E. KINGBIRD	444	3/3	2/2	8/7	5/5	10/10		28/27	
W. KINGBIRD	447	4/3		1/1	3/2			8/6	
GT. CREST FLYCATCHR	452								
E. PHOEBE	456								
SAY'S PHOEBE	457	3/3	9/9	1/1				13/13	
WILLOW FLYCATCHER	4664								
LEAST FLYCATCHER .	467								
E. WOOD PEWEE . . .	461								
W. WOOD PEWEE . . .	462								
HORNED LARK	474	240/50	54/21	80/28	14/8	145/41		533/146	
TREE SWALLOW . . .	614								
BANK SWALLOW . . .	616								
ROUGH-WG. SWALLOW	617			2/1		4/2		6/3	

		(65)	(69)	(72)	(75)	(78)	(81)	(84)	
Species	AOU	ROUTE						TOTAL INCL. D	
		C	F	P	M	D			
BARN SWALLOW . . .	613	1/1	4/2	3/3	2/1	3/3		13/10	
CLIFF SWALLOW . . .	612	6/5	323/6	1/1		5/4		385/24	
PURPLE MARTIN . . .	611								
BLUE JAY	477								
BLK-BILLED MAGPIE .	475		1/1		20/15			21/16	
COMMON CROW . . .	488				11/7			11/7	
BLK-CAP. CHICKADEE	735								
WHITE-BR. NUTHATCH	727								
HOUSE WREN	721			4/4	14/11			18/15	
LONG-BIL MARSH WREN	725								
SHORT-B. MARSH WREN	724								
ROCK WREN	715	27/22	1/1	1/1	7/4			34/28	
GRAY CATBIRD . . .	704								
BROWN THRASHER . .	705			9/9	8/6	4/4		21/17	
SAGE THRASHER . . .	702								
AM. ROBIN	761	6/5		9/7	3/3			18/15	
VEERY	756								
E. BLUEBIRD	766								
MOUNTAIN BLUEBIRD	768								
SPRAGUE'S PIPIT . .	700		5/5	5/4		20/17		30/24	
CEDAR WAXWING . .	619								
LOGGERHEAD SHRIKE .	622		1/1	2/2	1/1			4/4	
STARLING	493	4/3			28/7	8/2		40/12	
RED-EYED VIREO . .	624								
WARBLING VIREO . .	627				1/1			1/1	
YELLOW WARBLER . .	652	2/1		7/4	5/3	1/1		15/9	
COM. YELLOWTHROAT	681		1/1	4/3	5/4	2/1		12/9	
YELLOW-BR. CHAT . .	683			5/3	6/4			9/7	
AM. REDSTART . . .	687								
HOUSE SPARROW . . .	6882	33/8	2/1	2/1	7/3	1/1		46/11	
BOBOLINK	494								
W. MEADOWLARK . .	5011	128/48	26/10	266/50	199/47	231/50		1085/45	
YEL-HD. BLACKBIRD .	497				8/1	2/1		10/2	
RED-WG. BLACKBIRD .	498	52/18	6/4	20/17	49/12	19/6		149/59	
ORCHARD ORIOLE . .	506								
NORTHERN ORIOLE .	507			3/2				3/2	
BREWER'S BLACKBIRD .	510	3/2	3/2	1/1	14/9			21/14	
COMMON GRACKLE . .	511	5/4			4/2	10/3		19/9	
BROWN-HD. COWBIRD	495	15/6	26/4	27/14	9/7	27/11		109/45	
ROSE-BR. GROSBEAK .	595								
BLACK-HD. GROSBEAK	596								
BLUE GROSBEAK . . .	597								
INDIGO BUNTING . .	598								
LAZULI BUNTING . .	599								
DICKCISSEL	604								
AM. GOLDFINCH . . .	529		2/2	10/7	1/1			13/10	
RUFOS-SIDE TOWHEE	587			5/5	11/9	3/3		14/17	
LARK BUNTING . . .	605	70/22	21/6	23/13	7/2	5/2		126/45	
SAVANNAH SPARROW	542	1/1						1/1	
GRASSHOPPER SPARROW	546	2/2	4/2	8/8		23/6		34/20	
BAIRD'S SPARROW . .	545	2/2		6/4	2/2	6/6		16/8	
VESPER SPARROW . . .	540	5/5	41/23	32/22	30/17	10/6		118/73	
LARK SPARROW	552	1/1	7/6	3/3	11/9	2/2		24/21	
CHIPPING SPARROW .	560								
CLAY-COL. SPARROW	561			1/1	12/7			13/8	
BREWER'S SPARROW . .	562		27/5	7/4		6/2		40/21	
FIELD SPARROW . . .	563		1/1	9/8	15/12			25/21	
SWAMP SPARROW . . .	584								
SONG SPARROW	581				1/1			1/1	
MCCOWN'S LONGSPUR	539	8/4						8/4	
CH-COL. LONGSPUR .	538	72/30	14/6			44/22		130/58	
CANADA GOOSE . . .			9/2			1/1		10/3	
GOLDEN EAGLE . . .							1/1	1/1	
PRAIRIE FALCON . . .			1/1					1/1	
EARED GREBE						1/1		1/1	
RING-NECKED DUCK .						1/1		1/1	

JUNE 1981		(65)	(69)	(72)	(75)	(7R)	(81)	(84)	(88)
Species	AOU	ROUTE						TOTAL EXCL. W	
		C	F	P	M	D	W		
PIED-BILLED GREBE . .	006								
DBL-CR. CORMORANT	120		1/1			6/1			7/2
GREAT BLUE HERON .	194					1/1			1/1
BLK-CR. NIGHT HERON	202								
AM. BITTERN.	190								
MALLARD.	132						1/1		
GADWALL	135						1/1		
PINTAIL.	143		3/1						3/1
GREEN-WINGED TEAL	139								
BLUE-WINGED TEAL .	140						6/1		
AM. WIGEON	137								
N. SHOVELER.	142								
WOOD DUCK.	144								
REDHEAD.	146								
CANVASBACK	147								
LESSER SCAUP	149					1/1			1/1
RUDDY DUCK	167								
RED-TAILED HAWK .	337			2/1			1/1		2/1
SWAINSON'S HAWK .	342	3/2	1/1	1/1		1/1	1/1		6/5
FERRUGINOUS HAWK .	348	2/2				2/2	2/1		4/4
MARSH HAWK	331		2/2	1/1	1/1	1/1	2/2		5/5
AM. KESTREL	360	2/2	3/2	1/1	2/2				4/7
SHARP-TAIL. GROUSE	308								
BOBWHITE	289								
RING-NECK PHEASANT	3091	15/12		5/5	55/32	1/1	3/8		76/50
GRAY PARTRIDGE. . .	2881								
SORA	214				1/1				1/1
AM. COOT	221								
KILLDEER.	273	14/10	7/6	10/15	14/8	14/10	11/4		75/47
COMMON SNIFE . . .	230								
LONG-BILLED CURLEW	264			1/1	1/1				2/2
UPLAND SANDPIPER .	261			4/3	7/7				11/10
SPOTTED SANDPIPER .	263						2/1		
WILLET	258			1/1		1/1			2/2
MARbled GODWIT . .	249								
AM. AVOCET	225								
WILSON'S PHALAROPE	224					4/1	3/1		4/1
RING-BILLED GULL . .	054	2/1		3/1	2/2				7/4
FRANKLIN'S GULL . .	059								
BLACK TERN	077								
ROCK DOVE.	3131	6/1		21/1					27/2
MOURNING DOVE. . .	316	37/17	55/3	43/23	70/34	22/15	21/12		247/121
YELLOW-BIL. CUCKOO	387								
BLACK-BILL CUCKOO	388			1/1	4/3				5/4
GREAT HORNED OWL	375		2/1						2/1
BURROWING OWL. . .	378				12/2				12/2
SHORT-EARLD OWL .	367								
COMMON NIGHTHAWK	420	3/3	11/7	1/5	3/3	3/3	2/2		27/23
CHIMNEY SWIFT . . .	423								
BELTED KINGFISHER .	390								
COMMON FLICKER .	412				12/11				12/11
RED-HD. WOODPECKER	406				1/1				1/1
HAIRY WOODPECKER	393								
DOWNY WOODPECKER	394								
E. KINGBIRD	444	4/4	2/1	5/4	14/13	11/9	6/3		36/31
W. KINGBIRD.	447	5/5			5/2	2/1			12/8
GT. CREST FLYCATCHR	452								
E. PHOEBE	456								
SAY'S PHOEBE	457	2/2	11/4	6/4		2/2	1/1		19/16
WILLOW FLYCATCHER	4664								
LEAST FLYCATCHER .	467	1/1		1/1					2/2
E. WOOD PEWEE . . .	461								
W. WOOD PEWEE . . .	462				1/1				1/1
HORNED LARK	474	160/48	56/29	5/2	30/15	119/42	114/40		445/170
TREE SWALLOW . . .	614								
BANK SWALLOW . . .	616								
ROUGH-WG. SWALLOW	617	3/2			1/1	1/1	3/1		5/4

		(65)	(69)	(72)	(75)	(7R)	(81)	(84)	(88)
Species	AOU	ROUTE							TOTAL
		C	F	P	M	D	W	EXCL. W.	
BARN SWALLOW . . .	613	8/6		1/5	7/6	2/1	2/2	27/18	
CLIFF SWALLOW . . .	612	25/2	20/2	10/4	35/1	18/6		773/24	
PURPLE MARTIN . . .	611								
BLUE JAY	477								
BLK-BILLED MAGPIE . .	475		13/4		27/14	8/5	7/4	47/27	
COMMON CROW	488				2/2			2/2	
BLK-CAP. CHICKADEE	735				1/1			1/1	
WHITE-BR. NUTHATCH	727								
HOUSE WREN	721	1/1		4/3	15/10			20/14	
LONG-BIL MARSH WREN	725								
SHORT-B. MARSH WREN	724								
ROCK WREN	715		12/20		3/3	6/4	14/11	47/33	
GRAY CATBIRD	704			1/1	2/2			3/3	
BROWN THRASHER . . .	705		1/1	4/3	4/3	4/7	12/9	18/14	
SAGE THRASHER	702		1/1					1/1	
AM. ROBIN	761	4/3		3/3	4/4		2/2	11/10	
VEERY	756								
E. BLUEBIRD	766								
MOUNTAIN BLUEBIRD	768	2/2	1/1				2/2	3/3	
SPRAGUE'S PIPIT . . .	700	1/1	3/3	2/1		12/9	11/11	18/14	
CEDAR WAXWING . . .	619								
LOGGERHEAD SHRIKE .	622	4/3	4/5	5/4	10/6	7/5	3/3	34/23	
STARLING	493	3/2		2/2	7/4	14/4	7/2	26/12	
RED-EYED VIREO . . .	624								
WARBLING VIREO . . .	627			2/2	1/1			3/3	
YELLOW WARBLER . . .	652	4/3		7/4	7/6	2/2		20/15	
COM. YELLOWTHROAT	681	5/4			10/8	2/1		17/13	
YELLOW-BR. CHAT . . .	683			1/1	10/8			11/4	
AM. REDSTART	687								
HOUSE SPARROW . . .	6882	22/7	2/1	2/2	8/5		1/1	34/15	
BOBOLINK	494	2/1		2/1		7/2		7/4	
W. MEADOWLARK . . .	5011	123/47	158/48	70/44	193/49	134/49	118/49	705/237	
YEL-HD. BLACKBIRD . .	497				8/3	6/2		14/5	
RED-WG. BLACKBIRD .	498	65/26	14/4	11/7	42/10	25/12	14/9	157/64	
ORCHARD ORIOLE . . .	506					2/1		2/1	
NORTHERN ORIOLE . .	507			1/1			1/1	1/1	
BREWER'S BLACKBIRD .	510	4/2	2/2	3/2	30/10	17/6	6/4	56/22	
COMMON GRACKLE . .	511	3/3			4/3	2/1		4/7	
BROWN-HD. COWBIRD	495	7/5	5/5	2/1	10/8	12/12	12/10	36/31	
ROSE-BR. GROSBEAK . .	595								
BLACK-HD. GROSBEAK	596								
BLUE GROSBEAK	597								
INDIGO BUNTING . . .	598								
LAZULI BUNTING . . .	599				5/4			5/4	
DICKCISSEL	604								
AM. GOLDFINCH	529	3/1		5/5	17/13			25/19	
RUFIOUS-SIDE TOWHEE	587		1/1	1/1	20/15	5/4	4/4	27/21	
LARK BUNTING	605	91/26	15/6	15/3	61/15	60/30	76/27	315/101	
SAVANNAH SPARROW	542	2/2				2/2		4/4	
GRASSHOPPER SPARROW	546	12/12	11/7	6/5	1/1	20/13	12/12	76/34	
BAIRD'S SPARROW . . .	545	6/5			1/1	8/5	1/1	18/11	
VESPER SPARROW . . .	540	10/5	4/20	16/12	19/15	15/11	35/21	109/64	
LARK SPARROW	552		6/4	1/1	7/5	1/1	3/2	25/21	
CHIPPING SPARROW . .	560								
CLAY-COL. SPARROW	561				12/10			12/10	
BREWER'S SPARROW . .	562		20/10	10/6		6/3	4/4	52/27	
FIELD SPARROW	563		2/2	1/2	27/23			20/31	
SWAMP SPARROW . . .	584								
SONG SPARROW	581				1/1			1/1	
MCCOWN'S LONGSPUR	539	30/15						30/15	
CH-COL. LONGSPUR . .	538	106/34	2/6		1/1	48/21	60/26	115/62	
COMMON TERN						2/2		2/2	
WHITE PELICAN			1/2			X		1/2	
CLIFF SWALLOW			1/1					1/1	
SAGE SPARROW			1/1					1/1	
.									
.									

(65) (69) (72) (75) (78) (81) (84) (88)

Species	AOU	Route			
		D	W		
PIED-BILLED GREBE	006				
DBL-CR. CORMORANT	120				
GREAT BLUE HERON	194				
BLK-CR. NIGHT HERON	202				
AM. BITTERN.	190				
MALLARD.	132	5/2			
GADWALL	135				
PINTAIL.	143				
GREEN-WINGED TEAL	139				
BLUE-WINGED TEAL	140				
AM. WIGEON	137	2/1			
N. SHOVELER.	142				
WOOD DUCK.	144				
REDHEAD.	146				
CANVASBACK	147				
LESSER SCAUP	149	1/1			
RUDDY DUCK	167				
RED-TAILED HAWK	337	2/1	5/3		
SWAINSON'S HAWK	342	1/1	2/1		
FERRUGINOUS HAWK	348	2/2	2/1		
MARSH HAWK	331	2/2	2/3		
AM. KESTREL	360		3/1		
SHARP-TAIL. GROUSE	308	2/1			
BOBWHITE	289				
RING-NECK PHEASANT	3091				
GRAY PARTRIDGE.	2881		2/1		
SORA	214				
AM. COOT	221				
KILLDEER	273	29/10	2/3		
COMMON SNIP	230				
LONG-BILLED CURLEW	264				
UPLAND SANDPIPER	261		1/1		
SPOTTED SANDPIPER.	263	1/1	2/1		
WILLET	258				
MARBLD GODWIT	249				
AM. AVOCET	225				
WILSON'S PHALAROPE	224		1/1		
RING-BILLED GULL	054				
FRANKLIN'S GULL	059				
BLACK TERN	077				
ROCK DOVE.	3131				
MOURNING DOVE.	316	41/25	29/15		
YELLOW-BIL. CUCKOO	387				
BLACK-BILL CUCKOO	388				
GREAT HORNED OWL	375				
HURROWING OWL.	378				
SHORT-EARED OWL	367				
COMMON NIGHTHAWK	420	10/8	5/4		
CHIMNEY SWIFT	423				
BELTED KINGFISHER	390				
COMMON FLICKER	412		1/1		
RED-HEAD. WOODPECKER	406				
HAIRY WOODPECKER	393				
DOWNY WOODPECKER	394				
E. KINGBIRD	444	17/15	15/12		
W. KINGBIRD.	447	5/5	6/4		
GT. CREST FLYCATCHER	452				
E. PHOEBE	456				
SAY'S PHOEBE	457	1/1			
WILLOW FLYCATCHER	4664				
LEAST FLYCATCHER	467				
E. WOOD PEWEE	461				
W. WOOD PEWEE	462				
HORNED LARK	474	88/31	120/36		
TREE SWALLOW	614				
BANK SWALLOW	616				
ROUGH-WG. SWALLOW	617	8/1	1/1		

(65) (69) (72) (75) (78) (81) (84) (87)

Species	AOU	ROUTE			
		D	W		
BARN SWALLOW . . .	613	4/4	2/1		
CLIFF SWALLOW . . .	612	4/4	2/1		
PURPLE MARTIN . . .	611				
BLUE JAY.	477				
BLK-BILLED MAGPIE .	475	19/8	3/2		
COMMON CROW . . .	488				
BLK-CAP. CHICKADEE	735				
WHITE-BR. NUTHATCH	727				
HOUSE WREN	721				
LONG-BIL MARSH WREN	725				
SHORT-B, MARSH WREN	724				
ROCK WREN.	715	4/4	9/7		
GRAY CATBIRD. . . .	704				
BROWN THRASHER . .	705	5/4			
SAGE THRASHER . . .	702				
AM. ROBIN.	761	1/1	4/3		
VEERY.	756				
E. BLUEBIRD	766				
MOUNTAIN BLUEBIRD	768				
SPRAGUE'S PIPIT . . .	700	27/9	13/9		
CEDAR WAXWING . .	619				
LOGGERHEAD SHRIKE.	622	14/7	18/15		
STARLING.	493		3/1		
RED-EYED VIREO . . .	624				
WARBLING VIREO. . .	627				
YELLOW WARBLER . .	652				
COM. YELLOWTHROAT	681	2/2			
YELLOW-BR. CHAT. .	683				
AM. REDSTART. . . .	687				
HOUSE SPARROW . . .	6882	2/2			
BOBOLINK.	494				
W. MEADOWLARK . .	5011	74/42	78/39		
YEL-HD. BLACKBIRD.	497				
RED-WG. BLACKBIRD.	498	5/1	4/2		
ORCHARD ORIOLE . .	506				
NORTHERN ORIOLE .	507		1/1		
BREWER'S BLACKBIRD.	510	21/6	8/4		
COMMON GRACKLE .	511				
BROWN-HD. COWBIRD	495	12/1	5/2		
ROSE-BR. GROSBEAK .	595				
BLACK-HD. GROSBEAK	596				
BLUE GROSBEAK . . .	597				
INDIGO BUNTING . .	598				
LAZULI BUNTING . .	599				
DICKCISSEL.	604				
AM. GOLDFINCH. . .	529	2/2			
RUFOS-SIDE TOWHEE	587	5/5	4/4		
LARK BUNTING. . . .	605	14/11	98/20		
SAVANNAH SPARROW	542				
GRASSHOPPER SPARROW	546	16/10	2/1		
BAIRD'S SPARROW. . .	545	5/5			
VESPER SPARROW . . .	540	2/2	8/5		
LARK SPARROW	552	1/1	4/2		
CHIPPING SPARROW. .	560				
CLAY-COL. SPARROW	561				
BREWER'S SPARROW. .	562	4/4			
FIELD SPARROW. . . .	563				
SWAMP SPARROW. . .	584				
SONG SPARROW. . . .	581				
MCCOWN'S LONGSPUR	539				
CH-COL. LONGSPUR.	538	18/12	23/16		
WHITE PELICAN.		x			
COMMON TERN		2/1			
SAGE GROUSE.		8/1			
.					
.					

NOTE: Section numbers in the first column correspond to those on the following map. Columns numbered 1 through 6 indicate, for each section, (1) mule deer 1981-82 winter density; (2) mule deer six-year winter density (1976-1982); (3) pronghorn 1981-82 winter density; (4) pronghorn six-year winter density (1976-1982); (5) pronghorn 1981 summer density; and (6) pronghorn five-year summer density (1977-1981).



Appendix D (continued)

SEC	1	2	3	4	5	6
1	001	000	000	000	000	000
2	002	000	000	000	000	000
3	003	000	000	000	000	000
4	004	000	000	000	000	000
5	005	000	000	000	000	000
6	006	000	000	000	000	000
7	007	000	000	000	000	000
8	008	000	000	000	000	000
9	009	000	000	000	000	000
10	010	000	000	000	000	000
11	011	000	000	000	000	000
12	012	000	000	000	000	000
13	013	000	000	000	000	000
14	014	000	000	000	000	000
15	015	000	000	000	000	000
16	016	000	000	000	000	000
17	017	000	000	000	000	000
18	018	000	000	000	000	000
19	019	000	000	000	000	000
20	020	000	000	000	000	000
21	021	000	000	000	000	000
22	022	000	000	000	000	000
23	023	000	000	000	000	000
24	024	000	000	000	000	000
25	025	000	000	000	000	000
26	026	000	000	000	000	000
27	027	000	000	000	000	000
28	028	000	000	000	000	000
29	029	000	000	000	000	000
30	030	000	000	000	000	000
31	031	000	000	000	000	000
32	032	000	000	000	000	000
33	033	000	000	000	000	000
34	034	000	000	000	000	000
35	035	000	000	000	000	000

*A standard card form, IBM electric 888157, is available for punching statements from this form.

SEC	1	2	3	4	5	6
1	025	000	000	000	000	000
2	026	000	000	000	000	000
3	027	000	000	000	000	000
4	028	000	000	000	000	000
5	029	000	000	000	000	000
6	030	000	000	000	000	000
7	031	000	000	000	000	000
8	032	000	000	000	000	000
9	033	000	000	000	000	000
10	034	000	000	000	000	000
11	035	000	000	000	000	000
12	036	000	000	000	000	000
13	037	000	000	000	000	000
14	038	000	000	000	000	000
15	039	000	000	000	000	000
16	040	000	000	000	000	000
17	041	000	000	000	000	000
18	042	000	000	000	000	000
19	043	000	000	000	000	000
20	044	000	000	000	000	000
21	045	000	000	000	000	000
22	046	000	000	000	000	000
23	047	000	000	000	000	000
24	048	000	000	000	000	000
25	049	000	000	000	000	000
26	050	000	000	000	000	000
27	051	000	000	000	000	000
28	052	000	000	000	000	000
29	053	000	000	000	000	000
30	054	000	000	000	000	000
31	055	000	000	000	000	000
32	056	000	000	000	000	000
33	057	000	000	000	000	000
34	058	000	000	000	000	000
35	059	000	000	000	000	000

*A standard card form, IBM electric 888157, is available for punching statements from this form.

Appendix D (continued)

SEQ SEC	1	2	3	4	5	6
049	00.00.00	00.00.00	00.00.00	00.00.00	00.00.00	00.00.00
050	00.42	00.42	00.42	00.42	00.42	00.42
051	02.03	02.03	02.03	02.03	02.03	02.03
052	01.58	01.58	01.58	01.58	01.58	01.58
053	04.00	00.02.71	00.02.71	00.02.71	00.02.71	00.02.71
054	05.00	00.02.20	00.02.20	00.02.20	00.02.20	00.02.20
055	00.00.50	00.00.50	00.00.50	00.00.50	00.00.50	00.00.50
056	00.00.00	00.00.00	00.00.00	00.00.00	00.00.00	00.00.00
057	02.08	02.08	02.08	02.08	02.08	02.08
058	00.83	00.83	00.83	00.83	00.83	00.83
059	00.50	00.50	00.50	00.50	00.50	00.50
060	00.13	00.13	00.13	00.13	00.13	00.13
061	00.00	00.00	00.00	00.00	00.00	00.00
062	00.96	00.96	00.96	00.96	00.96	00.96
063	00.00	00.00	00.00	00.00	00.00	00.00
064	00.00	00.00	00.00	00.00	00.00	00.00
065	16.00	00.21.00	00.21.00	00.21.00	00.21.00	00.21.00
066	00.00.00	00.00.00	00.00.00	00.00.00	00.00.00	00.00.00
067	00.00.00	00.00.00	00.00.00	00.00.00	00.00.00	00.00.00
068	10.00	00.04.25	00.04.25	00.04.25	00.04.25	00.04.25
069	00.00.00	00.00.00	00.00.00	00.00.00	00.00.00	00.00.00
070	00.00.00	00.00.00	00.00.00	00.00.00	00.00.00	00.00.00
071	00.33	00.33	00.33	00.33	00.33	00.33
072	00.00	00.00	00.00	00.00	00.00	00.00

A standard card form, IBM electric 8815, is available for punching statements from this form.

SEQ SEC	1	2	3	4	5	6
073	00.00.00	00.00.00	00.00.00	00.00.00	00.00.00	00.00.00
074	00.15	00.15	00.15	00.15	00.15	00.15
075	00.42	00.42	00.42	00.42	00.42	00.42
076	00.00	00.00	00.00	00.00	00.00	00.00
077	01.00	01.00	01.00	01.00	01.00	01.00
078	00.00.88	00.00.88	00.00.88	00.00.88	00.00.88	00.00.88
079	00.00.00	00.00.00	00.00.00	00.00.00	00.00.00	00.00.00
080	00.00.00	00.00.00	00.00.00	00.00.00	00.00.00	00.00.00
081	00.00	00.00	00.00	00.00	00.00	00.00
082	00.00	00.00	00.00	00.00	00.00	00.00
083	00.12	00.12	00.12	00.12	00.12	00.12
084	00.00	00.00	00.00	00.00	00.00	00.00
085	00.00	00.00	00.00	00.00	00.00	00.00
086	00.38	00.38	00.38	00.38	00.38	00.38
087	00.42	00.42	00.42	00.42	00.42	00.42
088	00.58	00.58	00.58	00.58	00.58	00.58
089	00.83	00.83	00.83	00.83	00.83	00.83
090	00.00	00.00	00.00	00.00	00.00	00.00
091	00.00	00.00	00.00	00.00	00.00	00.00
092	00.62	00.62	00.62	00.62	00.62	00.62
093	00.00	00.00	00.00	00.00	00.00	00.00
094	06.00	00.02.42	00.02.42	00.02.42	00.02.42	00.02.42
095	04.00	00.02.55	00.02.55	00.02.55	00.02.55	00.02.55
096	00.00	00.01.55	00.01.55	00.01.55	00.01.55	00.01.55

A standard card form, IBM electric 8815, is available for punching statements from this form.

Appendix D (continued)

SEQ SEC	1	2	3	4	5	6
1	2	3	4	5	6	7
097	00.00	02.16	00.00	00.00	1.00	01.32
098	00.00	00.00	00.00	02.17	00.33	00.57
099	00.00	00.17	00.00	00.00	00.00	00.05
100	00.00	02.33	00.00	00.00	00.00	00.05
101	00.00	00.00	00.00	00.33	01.00	00.00
102	00.00	04.72	00.00	00.00	00.00	00.00
103	00.00	01.75	00.00	00.00	00.25	00.00
104	00.00	01.67	00.00	05.58	09.00	05.94
105	00.00	01.80	00.00	05.00	10.00	07.50
106	00.00	02.05	00.00	00.00	00.00	01.94
107	00.00	01.34	00.00	01.33	00.67	00.00
108	00.00	06.45	00.00	00.00	00.00	00.00
109	00.00	00.00	00.00	00.00	00.00	00.00
110	00.00	00.00	00.00	00.33	00.33	00.33
111	00.00	00.00	00.00	00.00	00.00	00.00
112	00.00	01.58	00.00	18.63	15.00	06.52
113	00.00	00.00	00.00	00.00	02.67	07.65
114	00.00	00.00	00.00	00.73	10.67	03.33
115	00.00	00.00	00.00	00.00	03.10	00.71
116	00.00	00.00	00.00	01.43	04.67	00.93
117	00.00	00.00	00.00	00.00	00.00	00.80
118	00.00	00.00	00.00	00.00	00.00	00.80
119	00.00	00.00	00.00	00.00	00.00	00.80
120	00.00	00.03	00.00	06.67	01.33	00.00
121	00.00	00.00	00.00	00.00	00.00	00.00

MONTANA
DEPARTMENT OF NATURAL RESOURCES
& CONSERVATION

Helena, Montana



100 copies of this public document were published at an estimated cost of \$2.78 per copy, for a total cost of \$278.00, which includes \$258.00 for printing and \$20.00 for distribution.